

IntelliStation A Pro
Type 6217



User's Guide

IntelliStation A Pro
Type 6217



User's Guide

Note:

Before using this information and the product it supports, be sure to read the information in Appendix B, "Notices," on page 75.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 **Safety Information** (安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφαλείας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:



DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 2:



CAUTION:

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

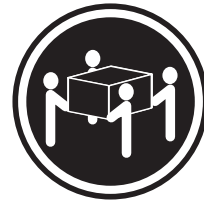
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

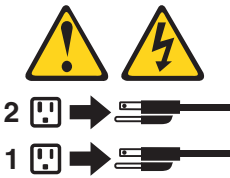
Use safe practices when lifting.

Statement 5:



CAUTION:

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:



CAUTION:

Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 23



CAUTION:

Do not place any object weighing more than 50 kg (110 lb) on top of rack-mounted devices.



>50 kg (110 lb)

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. **Wash hands after handling.**

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. **Lávese las manos después de usar el producto.**

Important:

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* document.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* document under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with your computer or optional device before you install the device.

Chapter 1. Introducing the IntelliStation A Pro computer

The IBM® IntelliStation® A Pro Type 6217 incorporates many of the latest advances in computing technology and can be expanded and upgraded as your needs change.

You can obtain up-to-date information about your computer and other IBM computer products at <http://www.ibm.com/pc/intellistation/>.

Note: The illustrations in this document might differ slightly from your hardware.

Related documentation

This *User's Guide* provides general information about your computer, including information about features, how to configure the computer, and how to install options. In addition to this *User's Guide*, the following documentation comes with your computer.

- *Installation Guide*

This printed document contains setup and installation instructions.

- *Problem Determination and Service Guide*

This document is in PDF on the IBM *IntelliStation Documentation* CD and at <http://www.ibm.com/pc/support/>. It contains information to help you solve problems that might occur in your IBM IntelliStation A Pro Type 6217 computer.

- *Safety Information*

This document is in Portable Document Format (PDF) on the IBM *IntelliStation Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Warranty and Support Information*

This document is in PDF on the IBM *IntelliStation Documentation* CD. It contains information about the terms of the warranty and about service and assistance.

- *Adaptec SCSI documentation*

This document is in PDF on the *Device Drivers* CD. It contains information and instructions for installing and configuring small computer system interface (SCSI) device drivers and devices.

- Readme files on the *Device Drivers* CD

Several readme files on this CD contain information about the preinstalled device drivers. Other readme files on this CD contain information about the various adapters and devices that might be installed in or attached to your computer.

- IBM *IntelliStation Documentation* CD

This CD contains all of the IBM IntelliStation A Pro Type 6217 documents in Portable Document Format (PDF).

Depending on your computer model, additional documentation might be included on the IBM *IntelliStation Documentation* CD.

The computer might have features that are not described in the documentation that you received with the computer. The documentation might be updated occasionally to include information about those features, or technical updates might be available

to provide additional information. These updates are available from the IBM Web site. To check for updated documentation and technical updates, complete the following steps:

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Browse by topic** section, click **Publications**.
3. On the Publications page, in the **Brand** field, select **IntelliStation**.
4. In the **Family** field, select **IntelliStation A Pro**.
5. Click **Continue**.

Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the IBM *IntelliStation Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following table provides a summary of the features and specifications of your computer. Depending on your model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Supports up to two AMD Opteron microprocessors (two 64-bit memory channels per microprocessor) • 1 MB Level-2 cache • 800 MHz front-side bus (FSB) with data rate of 1.6 GHz <p>Memory:</p> <ul style="list-style-type: none"> • Minimum: 1 GB • Maximum: 16 GB (depending on your configuration) • Type: PC2700 (2 GB DIMMs only) or PC3200 double-data-rate (DDR) registered • Connectors: Four or eight dual inline memory module (DIMM) connectors, depending on your configuration <p>Internal drives:</p> <ul style="list-style-type: none"> • Hard disk drive: SCSI or Serial ATA (SATA) • One of the following optical drives: <ul style="list-style-type: none"> – CD-ROM: IDE – CD-RW: IDE – DVD/CD-RW combo: IDE – DVD-ROM: IDE – DVD-RAM Multiburner Plus: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> • Three slim-high 3.5-inch drive bays (one hard disk drive installed in some models) • Two half-high 5.25-inch bays (optical drive installed in one bay) • One slim-high 3.5-inch removable-media or hard disk drive bay <p>PCI expansion slots:</p> <ul style="list-style-type: none"> • Four 100 MHz/64-bit PCI-X slots • One 133 MHz/64-bit PCI-X slot • One PCI Express x16 slot <p>Power supply:</p> <p>One 530 watt (115-230 V ac)</p> <p>Cooling:</p> <p>Five or six speed-controlled fans</p>	<p>Integrated functions:</p> <ul style="list-style-type: none"> • Broadcom 5703 10/100/1000 Ethernet controller with RJ-45 Ethernet connector • Integrated RAID capability • Two serial ports • One parallel port • Dual port Serial ATA controller • Two IEEE 1394A (FireWire) ports (four-pin on front, six-pin on rear) • Five Universal Serial Bus (USB) ports (two on front and three on rear) • Keyboard port • Mouse port • Audio ports <ul style="list-style-type: none"> – Line out (front and rear) – Mic (front and rear) – Line in (rear only) • Dual-channel IDE controller <p>Video adapter: (depending on your model)</p> <ul style="list-style-type: none"> • NVIDIA Quadro NVS 280 (DMS-59), PCI Express x16, with 64 MB DDR synchronous dynamic random access memory (SDRAM) video memory and dual analog connectors (or dual digital monitor capability with the purchase of an additional pigtail cable) • NVIDIA Quadro FX 1400 (DVI-I), PCI Express x16, with 128 MB DDR synchronous dynamic random access memory (SDRAM) with dual DVI-I connectors • NVIDIA Quadro FX 3400 (DVI-I), PCI Express x16, with 256 MB GDDR3 SDRAM video memory with dual DVI-I connectors • 3DLabs Wildcat Realizm 800 (DVI-I), PCI Express x16, with 512 MB GDDR3 (512-bit Unified) and 128 MB GDDR3 (128-bit direct burst) SDRAM video memory with dual DVI-I connectors <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50 or 60 Hz) required • Input voltage and frequency ranges automatically selected • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 90 V ac – Maximum: 137 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 180 V ac – Maximum: 265 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.24 kVA – Maximum: 0.86 kVA 	<p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 787 Btu (230 watts) • Maximum configuration: 3012 Btu (882 watts) <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Computer on: 10° to 35°C (50° to 95°F). Altitude: 0 to 2134 m (7000 ft) – Computer off: -40° to +60°C (-40° to 140°F). Maximum altitude: 2133 m (7000 ft) • Humidity (operating and storage): 8% to 80% <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idle: 4.7 bel • Sound power, operating: 5.3 bel <p>Size:</p> <ul style="list-style-type: none"> • Height: 438 mm (17.25 in.) • Depth: 483 mm (19 in.) • Width: 165 mm (6.5 in.) • Weight: 16.3 kg (36 lb) to 20.8 kg (45.8 lb) depending upon configuration <p>Notes:</p> <ol style="list-style-type: none"> 1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use. 2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.
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What your computer offers

Your computer uses the following features and technologies:

- **PCI Express x16 graphics adapter**

Your computer comes with an installed PCI Express x16 graphics adapter. This high-performance adapter supports high resolutions and includes many performance-enhancing features for your operating-system environment.

- **Large system-memory capacity**

Your computer supports up to 16 GB of system memory. Each memory controller provides error correcting code (ECC) support for up to four industry-standard PC2700 (2 GB DIMMs only) or PC3200, 2.5 V, 184-pin, registered, buffered, double-data-rate synchronous dynamic random access memory (DDR SDRAM) dual inline memory modules (DIMMs).

Note: The Microsoft® Windows® XP operating systems recognize and support a maximum of 4 GB of system memory.

- **Systems-management capabilities**

Your computer comes with features that a network administrator or server can use to remotely manage and control the computer. These features include Wake on LAN®, Remote Administration, and IBM Director Agent. See “Managing your computer” on page 18 for more information.

- **Integrated network support**

Your computer comes with an integrated Ethernet controller, which supports connection to a 10-Mbps, 100-Mbps, or 1-Gbps network. For more information, see “Configuring the Gigabit Ethernet controller” on page 30. The controller supports Wake on LAN technology.

Software

Your computer comes with Microsoft Windows¹ XP Professional or Red Hat Enterprise Linux WS (Workstation) preinstalled and a variety of software, including application programs, diagnostic tools, and device drivers.

Important: The software, other than the operating system, is licensed under the terms of the IBM International License Agreement for Non-Warranted Programs. Use of your computer signifies acceptance of this license agreement. For detailed instructions about viewing the license agreement, see “Viewing the license agreement” on page 12.

1. The Microsoft Certificate of Authenticity is your assurance that the Windows software in your computer is legally licensed from Microsoft Corporation.

Preinstalled software

In addition to the operating system, your preinstalled software includes some or all of the following programs. Some programs might require setup and configuration before use:

- **Access IBM Message Center**

This program displays messages about software that is preinstalled on your computer. Access IBM Message Center also provides messages about new updates that are available to keep your software current.

- **Adobe Acrobat Reader**

You can use this program to read files in Portable Document Format (PDF), including your online documentation. You can download the most current versions of Adobe Acrobat Reader for other languages and operating systems from the Adobe Web site at <http://www.adobe.com>.

- **Device drivers**

Device drivers for factory-installed features are preinstalled on your computer. The latest device drivers are also available at <http://www.ibm.com/pc/support/>.

- **IBM Drive Letter Access**

This software comes on models with CD-RW drives or DVD/CD-RW combo drives only. You can use this program to copy files to CD-R or CD-RW media.

- **IBM Product Registration**

You can use this program to register your computer with IBM. When you register your computer with IBM, information is entered into a database so that you can be contacted in case of a recall or other problems. Some locations offer extended privileges and services to registered users.

- **IBM RecordNow**

This software comes on models with CD-RW drives or DVD/CD-RW combo drives only. You can use this program to record data or audio to CD-R or CD-RW media or to create copies of existing CDs.

- **WinDVD**

This software comes on models with DVD read capability. You can use this program to play DVDs.

- **DVDCreator**

This software comes on models with DVD write capability. You can use this program to create DVDs.

- **Norton AntiVirus for IBM**

You can use this program to detect and remove viruses from your computer.

- **Online Books**

You can use this program to access documentation that contains detailed information about your computer.

- **PC-Doctor**

This program contains diagnostic tools that you can use within your operating system. In addition to isolating hardware problems, these tools provide information about your computer operating environment and some software components. Support documentation is built into the help system.

- **Product Recovery program**

You can use this program to recover the operating system and other software programs in the event of a system failure.

Attention: The Product Recovery program is on a hidden, hard disk drive partition. Do not delete or otherwise destroy this partition.

You must have Internet access to use some of these programs. For more information about connecting to the Internet, see the operating-system documentation that comes with your computer.

See “Using preinstalled software” on page 11 for more information about your preinstalled software. For more information about using the recovery programs and solving problems, see “Solving problems” in the *Problem Determination and Service Guide* on the IBM *IntelliStation Documentation CD*.

Important:

1. You can reinstall the device drivers and applications that come with your computer from the directories on your hard disk. For more information about recovering the software, see “Recovering your operating system and preinstalled software” in the *Problem Determination and Service Guide*.
2. The device drivers and some programs are also available at <http://www.ibm.com/pc/support/> and on the *Device Drivers CD*.

Software on CD

In addition to your IBM-preinstalled programs and device drivers, additional software is provided on the *Device Drivers CD* or other CDs.

Software available on the World Wide Web

The following software is available from the IBM Web site:

- **IBM Director Agent**

You can use IBM Director Agent to view detailed information about your hardware and software, set up alerts, monitor a variety of system resources, and manage your asset security. IBM Director Agent streamlines and automates personal computer (PC) systems-management and support tasks, such as asset deployment and tracking.

- **Remote Deployment Manager**

Remote Deployment Manager (RDM) is a graphical, server-based system deployment program that enables mass unattended installations of operating systems, software images, device drivers, and BIOS code updates to remote systems. When used with the Wake on LAN feature, Remote Deployment Manager can remotely turn on your computer so that the installation can be done while the computer is not being used.

- **System Migration Assistant**

System administrators can use System Migration Assistant (SMA) to remotely transfer configurations, profile settings, printer device drivers, and files from an IBM or non-IBM computer to supported IBM systems.

See the product documentation for these tools to determine whether your operating system supports this software. To get information about these tools or to download any of this software, complete the following steps:

1. Go to <http://www.ibm.com/pc/support/>.
2. Under **Download**, click **Downloads & Drivers**.
3. From the **Brand** drop-down list, click **Systems Management**; then, click **Continue**.

4. Scroll down and click a product to get more details about the product or to download the product.

Reliability, availability, and serviceability features

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in your computer, the availability of the computer when you need it, and the ease with which you can diagnose and repair problems.

Your computer has the following RAS features:

- 24 hours a day, 7 days a week² customer support
- 3-year limited warranty
- Advanced Configuration and Power Interface (ACPI)
- Optional automatic computer restart after a power failure
- Automatic error retry or recovery
- Boot-block recovery
- Built-in, menu-driven configuration and setup programs
- Built-in, menu-driven SCSI configuration programs (some models)
- Diagnostic programs
- Cooling fans with speed-sensing capability
- Error codes and messages
- Error correcting code (ECC) double-data-rate (DDR) synchronous dynamic random access memory (SDRAM) with serial presence detect (SPD)
- Integrated Ethernet controller
- Monitoring support for temperatures, voltages, and fan speed
- Power-on self-test (POST)
- Self-Monitoring Analysis and Reporting Technology (SMART) on hard disk drives for early prediction of failures
- Read-only memory (ROM) checksums
- Upgradeable basic input/output system (BIOS) and POST code
- Wake on LAN capability

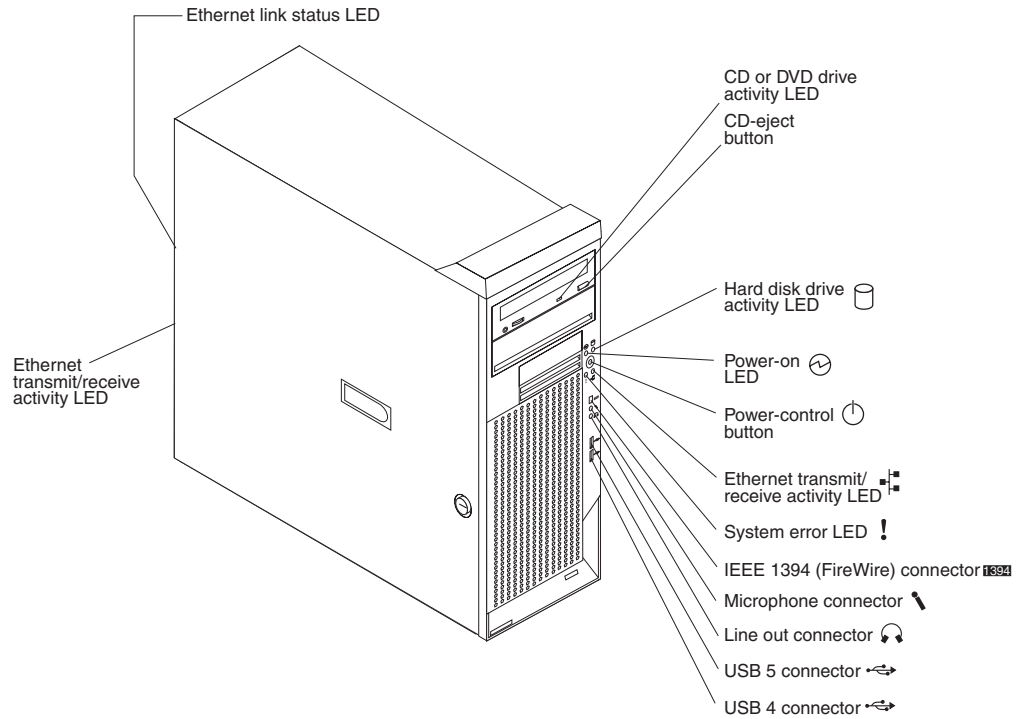
2. Service availability will vary by country. Response time varies; may exclude holidays.

Chapter 2. Operating the computer

This chapter provides information about how to use your computer.

Controls, LEDs, and connectors

The following illustration shows the controls, LEDs, and front connectors on the IntelliStation A Pro Type 6217 computer. See “Input/output connectors” on page 65 for an illustration and description of the connectors on the rear of the computer.



CD or DVD drive activity LED

When this LED is lit, it indicates that the CD or DVD drive is in use.

CD-eject button

Press this button to insert a CD or DVD into or remove a CD or DVD from the CD or DVD drive.

Ethernet link status LED

When this LED is lit, it indicates that there is an active connection on the Ethernet port. This LED is located on the rear of the computer.

Ethernet transmit/receive activity LED

When this LED is lit, it indicates that there is activity between the computer and the network. There are two of these LEDs, one on the front and one on the rear of the computer.

Hard disk drive activity LED

When this LED is lit, it indicates that the hard disk drive is in use.

IEEE 1394A (FireWire) connectors

Use these connectors (four-pin on the front and six-pin on the rear) to connect FireWire devices, such as digital video cameras and external hard disk drives.

Line out connector (green)

Use this connector to send audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, multimedia keyboards, or the audio line-in jack on a stereo system.

Mic connector (pink)

Use this connector to connect a microphone to your computer when you want to record voices or other sounds on the hard disk. You can also use this connector (and a microphone) with speech-recognition software.

Power-control button

Press this button to turn the computer on or off.

Power-on LED

When this LED is lit and not flashing, it indicates that the computer is turned on. When this LED is flashing, it indicates that the computer is off and still connected to an ac power source.

System-error LED

When this LED is lit, it indicates that a system error has occurred. An LED on the system board is also lit to help isolate the error.

USB connectors

Use these connectors to connect USB devices to your computer, using redundant Plug and Play technology. There are two on the front and three on the rear of the computer.

Turning on the computer

When the computer is connected to an ac power source but is not turned on, the operating system does not run, and all core logic is shut down; however, the computer can respond to remote requests to turn on the computer. The power-on LED flashes to indicate that the computer is connected to an ac power source but is not turned on.

Notes:

1. Turn on all external devices, such as the monitor, before turning on the computer.
2. The power-on LED on the front of the computer is lit when the computer is on and while it is being turned on.

Approximately 20 seconds after the computer is connected to ac power, the power-control button becomes active, and you can turn on the computer and start the operating system by pressing the power-control button. The computer can also be turned on in any of the following ways:

- If a power failure occurs while the computer is turned on, the computer will restart automatically when power is restored.
- When you connect the computer to power for the first time, the Wake on LAN feature can turn on the computer. If the computer was previously turned on, it must be turned off correctly for the Wake on LAN feature to turn on the computer.

What you see and hear when you start the computer depends on the features that are installed and the settings in the Configuration/Setup Utility program.

If the power-on self-test (POST) detects a problem, there might be a series of beeps or no beep, and a numeric error message might appear on the screen. Write

down any beep series and error code numbers with descriptions, and then see the *Problem Determination and Service Guide* for an explanation of the error codes.

On a computer running a Windows operating system, the following messages might be displayed briefly during startup:

- To start the Product Recovery Program, Press F11
- Press F1 for Configuration/Setup Utility, Press F12 for Boot Menu
- Press CTRL+A for SCSISelect Utility (some models)

On a computer running the Red Hat Linux operating system, the following messages might be displayed briefly during startup:

- Press F1 for Configuration/Setup Utility
- Press CTRL+A for SCSISelect Utility (some models)

To start the Product Recovery program in Red Hat Linux, watch the screen until the operating system selection menu is displayed and select **IBM Preload Recovery & Diagnostics**.

To use these features, press the applicable function key or keys quickly. The messages appear for only a short time. For more information about these messages, see “Using the Configuration/Setup Utility program” on page 21 and “Using the SCSISelect Utility program (some models)” on page 30.

Use the Configuration/Setup Utility program to configure passwords, PCI adapters, and other options.

The operating system and application programs start from the hard disk. If your computer is attached to a network, the computer will begin attaching to any LANs and remote applications to which you have access. A network administrator can also start your computer remotely to download programs or gather information about computer performance. For more information, see “Wake on LAN” on page 18.

Using preinstalled software

This section provides information to assist you in setting up the preinstalled operating system and describes how to use the programs that come with your computer.

Running the operating-system setup program

The setup program runs automatically when you start the computer the first time. The program will prompt you to make choices or type information. If you need more information than is provided in this *User's Guide*, see your operating-system manual.

Important:

1. After turning on your computer for the first time, you must complete the operating-system setup procedure before turning off your computer; otherwise, unexpected results might occur.
2. The setup program might be slightly different from the one described in your operating-system manual. Some choices do not appear because they are preset.
3. During the setup procedure, you must indicate that you accept the license agreement.

4. For Windows operating systems, the registration information will already be displayed in the registration field. If the Product ID number is not already displayed, you must type it. The Product ID number is on a label attached to the computer.

You will need the following information to complete the setup program:

- The documentation that comes with your computer.
- Network information from your network administrator, if your computer is being connected to a network.
- The printer model and port, if a printer is attached directly to your computer.

After the setup procedure is completed and the computer restarts, the desktop opens, and the computer is ready for use.

Installing other operating systems

Your computer comes with Microsoft Windows XP Professional or Red Hat Enterprise Linux Workstation preinstalled. To install another operating system, follow the instructions in the documentation that comes with the operating system.

Note: If you plan to install a Microsoft Windows XP 32-bit operating system on a SCSI drive, you must have a diskette drive attached during installation to be able to load the SCSI driver.

If you are installing an operating system other than Microsoft Windows XP Professional or Red Hat Enterprise Linux Workstation, follow the instructions in the readme files on the *Device Drivers* CD to install the device drivers. You might also need additional software or device drivers.

Note: If you experience problems with the device drivers installed from the *Device Drivers* CD, you can obtain the latest device drivers from <http://www.ibm.com/pc/support/>.

Before installing any operating system, make sure that you obtain the latest updates. Contact the operating-system manufacturer or, if applicable, check the manufacturer's Web site to obtain the updates.

Additional information about operating systems is posted periodically at <http://www.ibm.com/pc/support/>.

Viewing the license agreement

The IBM International License Agreement for Non-Warranted Programs is viewable from the Access IBM folder. Use of your computer signifies acceptance of this agreement.

To view the license agreement in Windows XP, complete the following steps:

1. From the Windows XP desktop, click **Start → All Programs → Access IBM**.
2. Click **IBM License Agreement**.

For Red Hat Linux, when you start the computer, the License Agreement window opens. To accept the terms of the agreement, click **I Agree**. You can also view the license agreement by clicking the **IBM License Agreement** icon on the desktop.

Registering your computer

Registering your computer helps IBM provide better service to you. When IBM receives your registration information, the information is placed into a central technical support database. If you need technical assistance, the technical-support representative will have information about your computer. In addition, comments about your computer are reviewed by a team dedicated to customer satisfaction and are taken into consideration in making improvements to IBM computers.

Use one of the following methods to register your computer in Windows:

- From the Windows XP desktop, click **Start → All Programs → IBM Registration** and then follow the instructions. If you do not have access to the Internet, you can use the registration program that starts from the IBM Registration folder to print your registration information and provide your mailing address to IBM for future assistance.
- Register your computer at <http://www.ibm.com/pc/register/>.

For Red Hat Linux, click the **Register PC** icon on the desktop to register your computer on the World Wide Web.

Creating an emergency recovery-repair diskette in Windows

Note: To create and use a diskette, you must add a diskette drive to the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports → Disable Legacy Diskette A**).

At your earliest opportunity, create a recovery-repair diskette and an IBM Enhanced Diagnostics diskette, and store them in a safe place. In the unlikely event that the computer becomes unusable, you can use the recovery-repair diskette to access the Product Recovery program. For more information about using this diskette, see “Using the recovery-repair diskette in Windows” in the *Problem Determination and Service Guide*.

In Windows, you can create a recovery-repair diskette from the c:\ibmtools directory or from the Product Recovery program partition.

To create a recovery-repair diskette from the c:\ibmtools directory, complete the following steps:

1. Start the computer and operating system.
2. Use Windows Explorer to display the directory structure of the hard disk.
3. Open the c:\ibmtools folder.
4. Double-click **rrdisk.bat** and follow the instructions on the screen.

To create a recovery-repair diskette from the Product Recovery program partition, complete the following steps:

1. Shut down the operating system and turn off the computer.
2. Wait for at least 5 seconds; then, press and hold the F11 key while you restart the computer. When a menu appears, release the F11 key.
3. Use one of the following procedures:
 - If a menu is displayed in which you can select an operating system, use the arrow keys to select the operating system that is currently installed, press Enter, and then continue with the next step.

- If an operating system menu is not displayed, continue with the next step.
4. From the Product Recovery main menu, use the arrow keys to select **System utilities**, and then press Enter.
 5. Use the arrow keys to select **Create a Recovery Repair diskette**, and then press Enter.
 6. Follow the instructions on the screen.

See “Creating an IBM Enhanced Diagnostics diskette or CD in Windows” for information about how to create an IBM Enhanced Diagnostics diskette.

Creating an IBM Enhanced Diagnostics diskette or CD in Windows

Note: To create and use a diskette or CD, you must add a diskette, CD-RW, or DVD/CD-RW combo drive (if one is not already installed), to your computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports** → **Disable Legacy Diskette A**). To make sure that the CD or DVD drive work, you must ensure that the CD or DVD drive is in the boot order in the Configuration/Setup Utility program.

The *IBM Enhanced Diagnostics* diskette or CD is a self-starting diagnostics diskette or CD that you can use to test hardware components in your computer. You can only create an IBM Enhanced Diagnostics diskette from the Product Recovery program. However, you can create an IBM Enhanced Diagnostics diskette or CD from the World Wide Web.

To create an IBM Enhanced Diagnostics diskette from the Product Recovery program partition, complete the following steps:

1. Restart the computer and watch the monitor.
2. When the message To start the Product Recovery Program, Press F11 appears, quickly Press F11.
3. Select **System utilities**.
4. Select **Create IBM Enhanced Diagnostics Diskette**.
5. Follow the instructions on the screen.

To create an IBM Enhanced Diagnostics diskette from the World Wide Web, complete the following steps:

1. Go to <http://www.ibm.com>.
2. Click **Support & downloads**.
3. Click **Search technical support**.
4. In the **Enter keyword(s)** field, type *diagnostics 6217*, and click **Submit**.
5. From the “Search results” page, click the Enhanced Diagnostics item for your computer.
6. On the next page, click the executable file for the Enhanced Diagnostics code to download it (be sure to download the file to a hard disk directory and not to a diskette). You can click the text file to display the readme file.
7. At a command prompt, change to the directory where the file was downloaded.
8. Insert a blank, high-density diskette into the diskette drive.
9. Type *filename a:* where *filename* is the name of the file you downloaded and *a* is the drive letter of the diskette drive; then, press Enter.

The downloaded file is self-extracting and is copied to the diskette. When the copy is completed, store the diskette in a safe place.

To download the latest CD image of the IBM Enhanced Diagnostics from the Web and create a startable Enhanced Diagnostics CD, complete the following steps:

1. Go to <http://www.ibm.com>.
2. Click **Support & downloads**.
3. Click **Search technical support**.
4. In the **Enter keyword(s)** field, type `diagnostics 6217`, and click **Submit**.
5. From the “Search results” page, click the Enhanced Diagnostics item for your computer.
6. On the next page, click the CD image file for the Enhanced Diagnostics code and download it using a writeable optional device (CD-RW or DVD/CD-RW combo drive).

For more information, see “Using the IBM Enhanced Diagnostics diskette or CD” in the *Problem Determination and Service Guide*.

Using video features

Your computer has a PCI Express x16 graphics adapter that renders 2D or 3D image quality and uses a standard video protocol for displaying text and graphic images. The adapter supports a variety of video modes (combinations of resolution, refresh rate, and color that are defined by a video standard for displaying text or graphics).

Video device drivers

To use the full capabilities of the graphics adapter in your computer, some operating systems and application programs require custom video device drivers. These device drivers provide greater speed, higher resolution, more available colors, and flicker-free images.

Device drivers for the graphics adapter and a readme file with instructions for installing the device drivers are provided on the *Device Drivers* CD that comes with your computer and in the `c:\ibmtools\drivers` directory on the hard disk. Use the device-driver installation instructions if you need to reinstall the device drivers or if you need information about obtaining and installing updated device drivers. For more information about installing device drivers, see “Recovering or installing device drivers” in the *Problem Determination and Service Guide*.

Changing monitor settings

To get the best possible image on your screen and to reduce flicker, you might need to reset the resolution and refresh rate of your monitor. You can view and change monitor settings through the operating system using the instructions in the readme files on the *Device Drivers* CD or in the `c:\ibmtools\drivers\` directory on the hard disk. See your operating-system documentation for more information about monitor settings.

Attention: Before changing monitor settings, review the documentation that comes with your monitor. Using a resolution or refresh rate that the monitor does not support might cause the screen to become unreadable and could damage the monitor. The information that comes with your monitor usually includes resolution and screen refresh rates that the monitor supports. If you need additional information, contact the manufacturer of the monitor.

If you are using a cathode ray tube (CRT) monitor, set the monitor for the highest noninterlaced refresh rate that it supports. If the monitor complies with the Video Electronics Standards Association (VESA) display data channel (DDC) standard, it probably is already set to the highest refresh rate that the monitor and video controller support. If you are not sure whether your monitor is DDC-compliant, see the documentation that comes with the monitor.

If you are using a flat-panel monitor, the refresh rate does not have to be set to the highest noninterlaced refresh rate that the monitor supports. Flat-panel monitors produce flicker-free images even when they are operating at a minimum 60 Hz noninterlaced rate.

If you have a dual-monitor video adapter, see the video adapter device-driver readme file and documentation for more information about enabling dual monitors.

Using audio features

Your computer has an integrated audio controller that supports Sound Blaster applications. Your computer also has a single internal speaker and three types of audio connectors. Using the audio controller, you can record and play back sound and music to enhance multimedia applications. Optionally, you can connect external speakers to the line-out connector to provide improved sound with multimedia applications.

The audio connectors in your computer are 3.5 mm (0.125-in.) mini-jacks. For the location of the audio connectors, see “Input/output connectors” on page 65.

Line in

This connector accepts audio signals into the computer sound system from external devices, such as the line output from a stereo, television, or a musical instrument. One line-in connector is on the rear of the computer.

Line out

This connector sends audio signals from the computer to external devices, such as speakers with built-in amplifiers, headphones, multimedia keyboards, or the audio line-in jack on a stereo system. Line-out connectors are on both the front and the rear of the computer.

Microphone

Use this connector to connect a microphone to your computer when you want to record voice or other sounds on the hard disk. With a microphone attached to the computer, you can also use speech-recognition software. Microphone connectors are on both the front and the rear of the computer.

Using security features

To deter unauthorized use of your computer, you can use anti-intrusion features and other security features that are provided with the computer.

Anti-intrusion features

IBM anti-intrusion features help protect against the theft of computer components, such as the microprocessor, system memory modules, or hard disk drives.

A cover lock is built into the computer to prevent the cover from being removed. Two identical keys for the cover lock are also supplied. A tag that is attached to the keys has the key serial number and the address of the key manufacturer.

Important: Keep the key-code number, manufacturer address, and phone number in a safe place. Because locksmiths are not authorized to duplicate cover-lock keys, you must order replacement keys from the key manufacturer. You will need the key code when ordering replacement keys.

You can set the chassis-intrusion detector inside the computer to alert the network administrator each time the computer cover is removed. For more information about enabling the chassis-intrusion detection, see Chapter 3, “Configuring the computer,” on page 21.

Component protection

Each component in your computer has a serial number that you can register with a security company. You can register the components individually, or you can register the entire computer. By registering computer components, you can improve the chances of identifying the components if they are ever stolen and recovered. For more information about component registration, go to <http://www.ibm.com/pc/support/>.

Data protection

You can lose data from the hard disk for a variety of reasons. Security violations, viruses, or hard disk drive failures can all cause data loss. To help protect against the loss of valuable data, IBM has incorporated the following data-saving features in your computer:

- **SMART hard disk drive**

Your computer comes with a self-monitoring and reporting technology (SMART) hard disk drive that is enabled to report potential hard disk failures. If an error is detected, a Desktop Management Interface (DMI) compliant warning message is displayed on the monitor screen and, if the computer is part of a network, on the administrator console. When an error is detected, the data on the hard disk can be backed up and the drive replaced.

- **Virus protection**

Your computer has built-in virus protection that you can enable through the IBM Configuration/Setup Utility program. This built-in protection checks for viruses in the boot record only. Also, Norton AntiVirus for IBM is available on the hard disk.

Locking the keyboard

You can lock the keyboard so that others are unable to use it. If you have set a user password, the keyboard is locked when you turn on the computer. You must type the password to unlock the keyboard. See “Passwords” on page 24.

Some operating systems have a keyboard and mouse lock-up feature. See the documentation that comes with your operating system for more information.

Updating system programs

System programs are the basic layer of software that is built into your computer. They include the power-on self-test (POST), the basic input/output system (BIOS), and the Configuration/Setup Utility program.

System programs are stored in electrically erasable programmable read-only memory (EEPROM) on the system board. This is sometimes referred to as flash memory.

IBM occasionally makes changes and enhancements to the system programs. When updates are released, they are available as downloadable files on the World Wide Web (see Appendix A, “Getting help and technical assistance,” on page 73). You can update system programs by starting your computer using a flash update diskette, or if the computer is connected to a network, a network administrator can update the system programs remotely. Instructions for using system program updates are included in a readme file that comes with the downloadable files.

Managing your computer

Your computer comes with features that a network administrator or server can use to remotely manage and control the computer. This section describes some of these network-management tools. See the product documentation for these tools to find out whether your operating system supports this software. To get more detailed information about these tools or to download any of this software, complete the following steps:

1. Go to <http://www.ibm.com/pc/support/>.
2. Under **Download**, click **Downloads & Drivers**.
3. From the **Brand** drop-down list, click **Systems Management**; then, click **Continue**.
4. Scroll down and click a product to get more details about the product or to download the product.

Your computer supports the following system management tools:

- **IBM Director Agent**

IBM Director Agent streamlines and automates personal computer (PC) systems management and support tasks, such as asset deployment and tracking. These utilities are available for IBM computers at no additional charge, helping to reduce total cost of ownership of networked computers. IBM Director Agent is available at <http://www.ibm.com/pc/support/>.

You can use IBM Director Agent to view detailed information about your computer hardware and software, set up alerts, monitor a variety of system resources, and manage your asset security.

- **Wake on LAN**

A network administrator can use the Wake on LAN feature to turn on your computer from a remote location. When the Wake on LAN feature is used with network-management software, many functions, such as data transfers, software updates, and POST or BIOS code updates can be performed on many computers simultaneously.

Note: The Wake on LAN feature functions through the adapter in PCI-X slot 1 and only if the computer was properly shut down and turned off.

- **Remote Deployment Manager**

Remote Deployment Manager is a graphical, server-based program that performs mass unattended installations of operating systems, software, device drivers, and BIOS code updates to remote systems. Used with the Wake on LAN feature, Remote Deployment Manager can remotely turn on your computer so that installations can be done while the computer is not being used.

- **Software Migration Assistant**

A network administrator can use Software Migration Assistant (SMA) to remotely transfer configurations, profile settings, printer device drivers, and files from an IBM or non-IBM computer to supported IBM systems.

Shutting down the operating system

When you are ready to turn off the computer, use the shutdown procedure for your operating system to save data and prevent damage to your applications. See your operating-system documentation for more information.

If you are using the preinstalled Microsoft Windows XP operating system, complete the following steps to shut down the operating system and computer:

1. Save and close all files that you are working with.
2. Close all open applications.
3. Click **Start**.
4. Click **Turn Off Computer**; then, click **Turn Off** to confirm.

If you are using the preinstalled Red Hat Linux operating system, complete the following steps to shut down the operating system and computer:

1. Save and close all files with which you are working.
2. Close all open applications.
3. Click **Red Hat Linux Main Menu Button** → **Log out** → **Shut Down**.
4. Click **OK** to confirm.

Turning off the computer

When you turn off the computer and leave it connected to ac power, the computer can respond to requests, such as a remote request to turn on the computer. To remove all power from the computer, you must disconnect it from the power source.

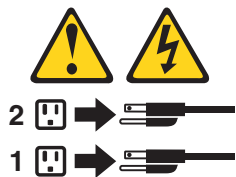
Some operating systems require an orderly shutdown before you turn off the computer. See your operating-system documentation for information about shutting down the operating system.

Statement 5:



CAUTION:

The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The computer can be turned off in any of the following ways:

- You can turn off the computer through the operating system. If this feature is supported by your operating system, it will turn off the computer after performing an orderly shutdown of the operating system. See “Shutting down the operating system” on page 19.
- You can press the power-control button on the front of the computer to start an orderly shutdown of the operating system and turn off the computer, if your operating system supports this feature.

Note: After turning off the computer, wait at least 5 seconds before you press the power-control button to turn on the computer again.

- You can press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the computer. You can use this feature to turn off the computer if the operating system stops functioning.

Chapter 3. Configuring the computer

The following configuration programs are available to configure your computer:

- **Configuration/Setup Utility program**

The Configuration/Setup Utility program is part of the basic input/output system (BIOS) code in your computer. You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the device startup sequence, set the date and time, set passwords, and set the chassis-intrusion detector. For information about using this utility program, see “Using the Configuration/Setup Utility program.”

- **Broadcom NetXtreme Gigabit Ethernet Boot Agent**

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in your computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in your startup sequence. You enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program. For information, see “Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent” on page 25.

- **Adaptec® HostRAID™ configuration programs**

- **Adaptec RAID Configuration Utility programs (for Serial ATA RAID)**

Use the Array Configuration Utility within the Adaptec RAID Configuration Utility programs to configure the integrated Serial ATA (SATA) controller with integrated RAID and the devices that are attached to it. For more information about using these utility programs, see “Using the Adaptec RAID Configuration Utility programs (for Serial ATA RAID)” on page 26.

- **SCSISelect Utility program (for SCSI RAID)**

Use the SCSI HostRAID feature of SCSISelect Utility program to configure the integrated SCSI controller with integrated RAID and the devices that are attached to it. For more information about using this utility program, see “Using the SCSISelect Utility program (for SCSI RAID)” on page 27.

- **ServeRAID Manager**

ServeRAID™ Manager is available as a stand-alone program and as an IBM Director extension. If a ServeRAID controller is installed in your computer, use ServeRAID Manager to define and configure your disk-array subsystem *before* you install your operating system. For information about using this program, see “Using ServeRAID Manager” on page 28.

- **Ethernet controller configuration**

To configure the integrated Gigabit Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 30.

- **SCSISelect Utility program (some models)**

If your computer comes with a SCSI adapter, you can use the SCSISelect Utility program to configure devices that are attached to the SCSI adapter. Use this program to change default values, resolve configuration conflicts, and perform a low-level format on a SCSI hard disk drive. For information about using this utility program, see “Using the SCSISelect Utility program (some models)” on page 30.

Using the Configuration/Setup Utility program

This section provides instructions for starting the Configuration/Setup Utility program and descriptions of the menu choices that are available.

Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the computer and watch the monitor screen. If the computer is already on when you start this procedure, you must shut down the operating system, turn off the computer, wait a few seconds until all in-use LEDs are turned off, and restart the computer.
2. When the message Press F1 for Configuration/Setup appears on the screen during startup, press F1. (This prompt appears on the screen for only a few seconds. You must press F1 quickly.) If you have set both a user password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. You can press F1 to display help information for a selected menu item. Depending on the version of the BIOS code in your computer, some menu choices might differ slightly from these descriptions.

- **System Summary**

Select this choice to view configuration information, including the type, speed, and cache size of the microprocessor and the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary. This choice is on the full and limited Configuration/Setup Utility menus.

- **System Information**

Select this choice to view the machine type and model of the computer, the serial number, the system board identifier, and the revision level and issue date of the BIOS code stored in the electrically erasable programmable ROM (EEPROM). When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Configuration/Setup Utility menu only.

- **Devices and I/O Ports**

Select this choice to set keyboard operating characteristics such as keyboard speed or numlock state and to enable or disable the PS/2 mouse, diskette controller, integrated SCSI controller, serial ATA controller, Ethernet controllers, legacy diskette drive, 1394 (FireWire) and standard ports (such as serial and parallel). **Enable** is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the integrated SCSI controller and no SCSI adapter is installed, the computer will have no SCSI capability. If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the computer will have no Ethernet capability.

Note: To use a diskette on your computer, you must add a diskette drive to the computer. To enable a USB diskette drive to work, you must disable the legacy diskette drive function in the Configuration/Setup Utility program (click **Devices and I/O Ports** → **Disable Legacy Diskette A**).

This choice is on the full Configuration/Setup Utility menu only.

- **Date and Time**

Select this choice to set the date and time in the computer, in 24-hour format (*hour:minute:second*).

This choice is on the Configuration/Setup Utility menu only.

- **Startup**

Select this choice to view or change the start options. Changes in the start options take effect when you start the computer.

The startup sequence specifies the order in which the computer checks devices to find a boot record. The computer starts from the first boot record that it finds.

Note: You can enable the computer to start from the network by enabling the BroadCom NetXtreme Gigabit Ethernet Boot Agent to configure the network as the first startable device in the startup sequence.

You can select to run POST in the quick mode or display the diagnostic screen.

This choice is on the full Configuration/Setup Utility menu only.

- **Advanced Setup**

Select this choice to change values for advanced hardware features, such as PCI configuration and hardware monitor.

Important: the computer might malfunction if these options are incorrectly configured. Follow the instructions on the screen carefully.

This choice is on the full Configuration/Setup Utility menu only.

- **Installed OS**

Select this choice to specify the operating system on the computer.

- **Reset Configuration Data**

Select this choice to clear the extended system configuration data (ESCD) area.

- **4 GB Memory Hole Adjust**

Select this choice to specify how the memory hole size will be determined.

- **Multiprocessor Specification**

Select this choice to set the multiprocessor specification revision level. Some operating systems require version 1.1 for compatibility.

- **MP table uses PCI entries**

Select this choice to configure the multiprocessor table with PCI-interrupt entries.

- **Fan Speed Control**

Select this choice to view or change the fan-speed control setting. Disabling the built-in fan speed control forces the computer fans to run full-speed at all times.

- **Chipset Configuration**

Attention: Do not make changes to the Chipset Feature unless directed to do so by an IBM authorized service representative.

Select this choice to modify settings that control features of the core chip set on the system board.

- **PCI configuration**

Select this choice to view the system resources that are used by the installed PCI or PCI-X devices.

- **Hardware Monitor**
Select this choice to display the computer temperature and voltage status, and fan speeds.
- **POST Error Log**
Select this choice to view the three most recent error codes and messages that were generated during POST, and to view the DMI log. Select **Clear error log** to clear the POST error log.
- **System Security**
Select this choice to set a user password or a supervisor (administrator) password. See “Passwords” for more information.
- **Power Management**
Select this choice to enable or disable system power settings, including automatic power-on settings such as Wake on LAN.
- **Save Settings**
Select this choice to save the changes you have made in the settings.
- **Restore Settings**
Select this choice to cancel the changes you have made in the settings and restore the previous settings.
- **Load Default Settings**
Select this choice to cancel the changes you have made in the settings and restore the factory settings.
- **Exit Setup**
Select this choice to exit from the Configuration/Setup Utility program. If you have not saved the changes you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Note: Always reset the Configuration/Setup Utility program to the default values (select **Load Default Settings**) after updating the BIOS code.

Passwords

From the **System Security** choice, you can set, change, and delete a user (power-on) password and an administrator password. The **System Security** choice is on the full Configuration/Setup menu only.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the user password or the administrator password.

If you set both a user password and an administrator password, you can type either password at the password prompt that appears as you start the computer. However, if you want to change the settings in the Configuration/Setup Utility program, you must type the administrator password to access the full Configuration/Setup Utility menu. If you type the user password, you have access to only the limited Configuration/Setup Utility menu.

Keep a record of your password in a secure place. If you forget the user or administrator password, you can regain access to the computer through one of the following methods:

- If you have forgotten the user password and an administrator password is set, type the administrator password at the power-on prompt. Start the Configuration/Setup Utility program and change the user password.

- Clear CMOS settings by changing the position of the CMOS recovery jumper (JP1). See “Erasing a lost or forgotten password (clearing CMOS” in the *Problem Determination and Service Guide* for instructions.
- Remove the battery and then reinstall the battery (see the *Problem Determination and Service Guide*).

Enabling the Broadcom NetXtreme Gigabit Ethernet Boot Agent

The Broadcom NetXtreme Gigabit Ethernet Boot Agent is part of the BIOS code in your computer. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in your startup sequence. You enable and disable the Broadcom NetXtreme Gigabit Ethernet Boot Agent from the Configuration/Setup Utility program.

To enable the Broadcom NetXtreme Gigabit Ethernet boot agent, complete the following steps:

1. From the Configuration/Setup Utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **System Board Ethernet PXE/DHCP** and use the Right Arrow (→) key to set it to **Enabled**.
3. Select **Save Settings** and press Enter.

Using the Adaptec HostRAID configuration programs

Use the Adaptec RAID Configuration Utility programs and SCSISelect Utility (also referred to as IBM ServeRAID-7e) to add RAID levels 0 and 1 functionality to the integrated Serial ATA controller and the integrated SCSI controller. Be sure to use these programs as described in this document. Use these programs to:

- Configure a redundant array of independent disks (RAID) array
- View or change your RAID configuration and associated devices

Consider the following information when using the Adaptec RAID Configuration Utility programs and SCSISelect Utility program to configure and manage arrays:

- The integrated SCSI controller RAID (SCSI models) and the integrated Serial ATA controller (SATA models) with integrated SATA RAID support RAID levels 0 and 1 with the option of having a hot-spare drive. Installing an optional ServeRAID controller provides additional RAID levels.
- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.
- If you install a different type of RAID controller in your computer, use the configuration method described in the instructions that come with that RAID controller to view or change SCSI settings for attached devices.

Using the Adaptec RAID Configuration Utility programs (for Serial ATA RAID)

Use the Array Configuration Utility within the Adaptec RAID Configuration Utility programs to add RAID levels 0 and 1 functionality to the integrated Serial ATA (SATA) controller. This utility is a part of the BIOS code in your computer. For additional information about using the Adaptec RAID Configuration Utility programs, see the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*. If this CD did not come with your computer, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

The integrated Serial ATA RAID feature (SATA HostRAID) comes disabled by default. You must enable the SATA RAID feature and install the device drivers before you can use it. The SATA RAID feature configuration utilities, device drivers, and information are available on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*.

Enabling the Serial ATA HostRAID feature

To enable the SATA RAID feature, complete the following steps:

1. Turn on the computer and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1. If you have set a supervisor password, you are prompted to type the password.
3. Select **Advanced Setup**.
4. Scroll down and select **HostRAID**.
5. Use the left and right arrow keys to select **SATA**.
6. Press Esc three times; then, select **Yes** to save your changes.

Using the Serial ATA HostRAID feature

The instructions in this section are for using the Array Configuration Utility program to access and perform an initial RAID level-1 configuration. If you install a RAID adapter in your server, use the configuration method described in the instructions that come with that adapter to view or change settings for the attached devices.

See the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about using the Array Configuration Utility program to create, configure, and manage arrays. If this CD did not come with your server, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

Configuring the controller: To use the Array Configuration Utility program to configure a level-1 RAID array, complete the following steps.

1. Turn on the computer and watch the monitor screen.
2. When the message Press <CTRL><<A> for Adaptec RAID Configuration Utility appears, press Ctrl+A.
3. Select **Array Configuration Utility (ACU)**.
4. Select **Create Array**.
5. From the list of ready drives, select the two drives that you want to group into the array.
6. Select **RAID-1** when asked to select the RAID level.
7. (optional) Type an identifier for the array.
8. Select **Quick Int** when asked for the array build method.

9. Follow the instructions on the screen to complete the configuration, and select **Done** to exit.
10. Restart the computer.

Viewing the configuration: To view information about the Serial ATA controller, complete the following steps:

1. Start the Array Configuration Utility.
2. From the Array Configuration Utility window, select **Manage Arrays**.
3. Select an array and press Enter.
4. Press Esc to exit the program.

Using the SCSISelect Utility program (for SCSI RAID)

Use the SCSISelect Utility to add RAID levels 0 and 1 functionality to the integrated SCSI controller. This utility is part of the BIOS code in your computer.

The integrated SCSI RAID feature (SCSI HostRAID) comes disabled by default. You must enable the SCSI RAID feature and install the device drivers before you can use it. The SCSI RAID configuration utilities, device drivers, and information are available on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD*. If this CD did not come with your server, you can download the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* from <http://www.ibm.com/pc/support/>.

Enabling the SCSI HostRAID feature

To enable the SCSI RAID feature, complete the following steps:

1. Turn on the computer and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1. If you have set a supervisor password, you are prompted to type the password.
3. Select **Advanced Setup**.
4. Scroll down and select **HostRAID**.
5. Use the left and right arrow keys to select **SCSI**.
6. Press Esc three times; then, select **Yes** to save your changes.
7. When the message Press <CTRL><A> for SCSISelect Utility appears, press Ctrl+A. If you have set a supervisor password, you are prompted to type the password.
8. Use the arrow keys to select the channel for which you want to change settings and press Enter.
9. Select **Configure/View SCSI Controller Setting**; then, select **HostRAID**.
10. Select **Enabled**.
11. Press Esc; then, select **Yes** to save the changes.

Using the SCSI HostRAID feature

The instructions in this section describe how to access the SCSI RAID feature from the SCSISelect Utility program and perform an initial RAID level-1 configuration on your computer. If you install a RAID adapter in your computer, use the configuration method described in the instructions that come with that adapter to view or change SCSI settings for attached devices.

See the documentation on the IBM *ServeRAID-7e (Adaptec HostRAID) Support CD* for additional information about how to use the SCSI HostRAID feature.

Configuring the controller: To use the SCSI HostRAID feature to configure a level-1 RAID array, complete the following steps:

1. From the SCSISelect main menu, select **Configure/View HostRAID Settings**.
2. From the list of ready drives, type C to create an array.
3. Select **RAID-1** when asked to select the RAID type.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Select **Create new RAID-1**.
6. Type an identifier for the array.
7. Select **Yes** to create the array.
8. Press Esc to exit the utility.
9. Restart the computer.

Viewing the configuration: You can use the SCSISelect Utility program to view information about the integrated SCSI controller. From the list of available arrays, select an array and press Enter. Press Esc to exit the utility.

Using ServeRAID Manager

Use the ServeRAID Manager program to:

- Configure arrays
- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the SCSI controller and perform an initial RAID configuration on your computer, you must run ServeRAID Manager in a Startable-CD mode, as described in the instructions in this section. If you install a RAID adapter in your computer, use the configuration method described in the instructions that come with the adapter to view or change SCSI settings for attached devices.

See the ServeRAID documentation on the **IBM ServeRAID Support** CD or additional information about RAID technology and instructions for using ServeRAID Manager to configure your SCSI controller. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions → Hints and tips**.

Configuring the controller

By running ServeRAID Manager in Startable CD mode, you can configure the controller before you install your operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run the ServeRAID Manager program in startable-CD mode, turn on the computer; then, insert the *IBM ServeRAID Support* CD into the CD-ROM drive. If the ServeRAID Manager program detects an unconfigured controller and ready drives, the program automatically starts the Configuration wizard.

In the Configuration wizard, you can select *Express configuration* or *Custom configuration*. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the two physical drives that you want to group into an array and create a hot-spare drive.

Using express configuration

To use Express configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller that you want to configure.
2. From the toolbar, click **Create**.
3. Click **Express configuration**.
4. Click **Next**. The “Configuration summary” window opens.
5. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Modify arrays** or **Modify logical drives**.

Note: Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system.

6. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
7. Exit from the ServeRAID Manager program and remove the CD from the CD-ROM drive.
8. Restart the computer.

Using custom configuration

To use custom configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller that you want to configure.
2. From the toolbar, click **Create**.
3. Click **Custom configuration**.
4. Click **Next**. The “Create arrays” window opens.
5. Click the appropriate tab in the right pane; then, from the list of ready drives, select the two drives you want to move to the array.
6. Click the icon to add the drives to the array.
7. Complete the following steps if you want to configure a hot-spare drive:
 - a. Click the **Spares** tab.
 - b. Select the physical drive you want to designate as the hot-spare drive; then, click the icon to add the drive.
8. Click **Next**. The “Configuration summary” window opens.
9. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Back**.
10. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
11. Exit from the ServeRAID Manager program, and remove the CD from the CD-ROM drive.
12. Restart the computer.

Viewing the configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

To display available actions for an item, click the item in the ServeRAID Manager tree and click **Actions**.

Configuring the Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. It provides an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet port in the computer supports auto-negotiation, the controller detects the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operates at that rate and mode.

You do not have to set any jumpers or configure the controller. However, you must install a device driver to enable the operating system to address the controller. For device drivers and information about configuring the Gigabit Ethernet controller, go to <http://www.ibm.com/pc/support/>

Using the SCSISelect Utility program (some models)

Use the SCSISelect Utility program to configure SCSI devices.

Starting the SCSISelect Utility program

To start the SCSISelect utility program, complete the following steps:

1. Turn on the computer.
2. When the prompt <<< Press <CTRL><A> for SCSISelect Utility! >>> prompt appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.
3. Use the arrow keys to select a choice for which you want to change settings, and press Enter.
4. When the prompt Would you like to configure the SCSI controller or run the SCSI disk utility? appears, make your selection and press Enter.
5. Use the arrow keys to select a choice from the menu.
6. Follow the instructions on the screen to change the settings of the selected items, and press Enter.

SCSISelect menu choices

The following choices are on the SCSISelect Utility menu:

- **Configure/View SCSI Controller Settings**

Select this choice to view or change SCSI controller settings. To reset the SCSI controller to its default values, press F6 and follow the instructions on the screen. You can view or change the following controller settings:

 - **SCSI Controller ID**

Select this choice to view the SCSI controller ID, which is typically 7.
 - **SCSI Controller Termination**

This choice is set to **Enabled** and cannot be changed.
 - **Boot Device Configuration**

Select this choice to configure bootable-device parameters. You must know the SCSI ID of the device that you want to configure.
 - **SCSI Device Configuration**

Select this choice to configure SCSI-device parameters. You must know the SCSI ID of the device that you want to configure.

The sync transfer rate is the transfer rate for Ultra SCSI devices. For Ultra3 SCSI LVD devices, the maximum rate is 160 MBps; for Ultra2 SCSI LVD devices, 80 MBps; for Fast SCSI devices, 20 MBps.

– **Advanced Configuration**

Select this choice to view or change the settings for advanced configuration options.

• **SCSI Disk Utilities**

Select this choice to view the SCSI ID assignments or to format a SCSI device. Select a device from the list and read the instructions on the screen carefully before making a selection.

If you press Ctrl+A before a selected drive is ready, an Unexpected SCSI Command Failure screen might appear. Restart the computer and watch the SCSISelect messages as each drive spins up. When the selected drive is ready, press Ctrl+A.

Chapter 4. Installing options

This chapter provides basic instructions for installing and replacing hardware options in the computer. For a list of supported options for your computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for your computer.

Installation guidelines

Before you begin installing options in your computer, read the following information:

- Read the safety information beginning on page v, and the guidelines in “Handling static-sensitive devices” on page 34. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for your computer, monitor, and other devices that you will connect to the computer.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- When you need to access the inside of the computer to install options, you might find it easier to lay the computer on its side.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the computer, open or close a latch, and so on.
- When you are finished working on the computer, reinstall all safety shields, guards, labels, and ground wires.

System reliability considerations

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- There is adequate space around the computer to allow the computer cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the computer. Do not place objects in front of the fans. For proper cooling and airflow, replace the computer cover before turning on the computer. Operating the computer for extended periods of time (more than 30 minutes) with the computer cover removed might damage computer components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices, and your computer. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

Notes:

1. If you are instructed to return a device or component, follow all packaging instructions. Use any packaging materials for shipping that are supplied to you.
2. Use product-specific electrostatic-discharge procedures when they exceed the requirements provided here.
3. Make sure that the electrostatic-discharge-protective devices you use have been certified (ISO 9000) as fully effective.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the computer for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the computer without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on your computer cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Select a grounding system that meets the specific service requirement. Use of a grounding system is recommended but is not required.
 - Attach the electrostatic-discharge ground clip to any frame ground, ground braid, or green-wire ground.
 - Use an electrostatic-discharge common ground or reference point when working on double-insulated or battery-operated devices. You can use coax or connector-outside shells on these devices.
 - Use the round ground-prong of the ac plug on ac-operated devices.

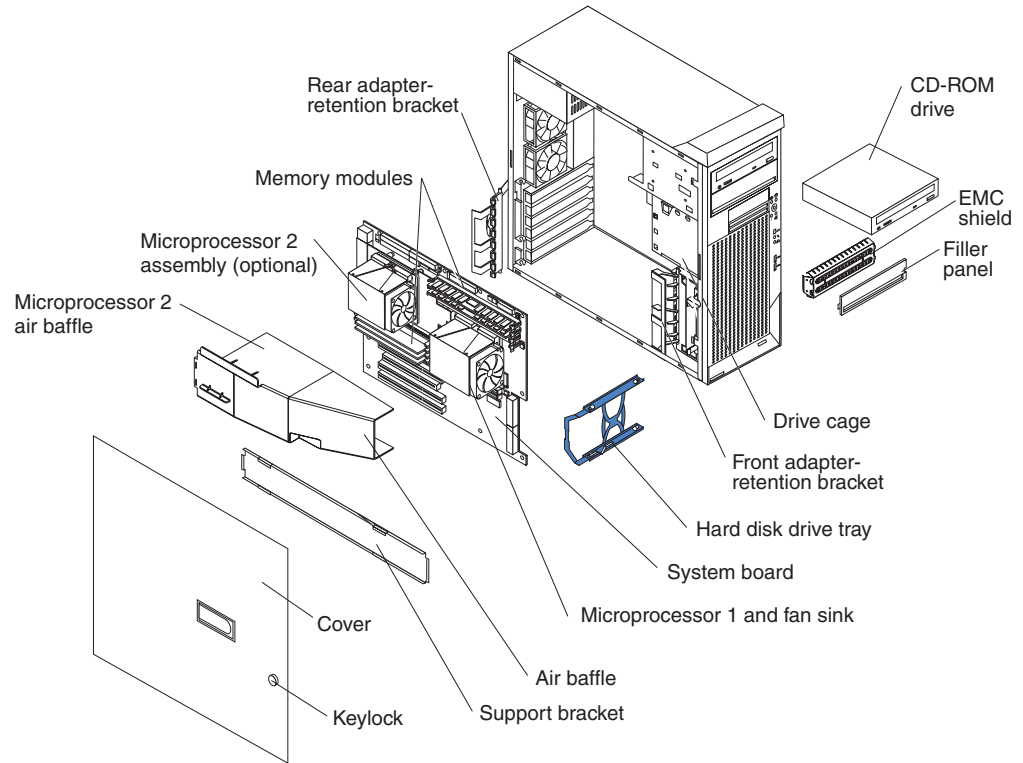
Installing options in your computer

This section provides instructions for installing hardware options in your computer.

Note: To remove the side cover and install options, you might find it easier to lay the computer on its side.

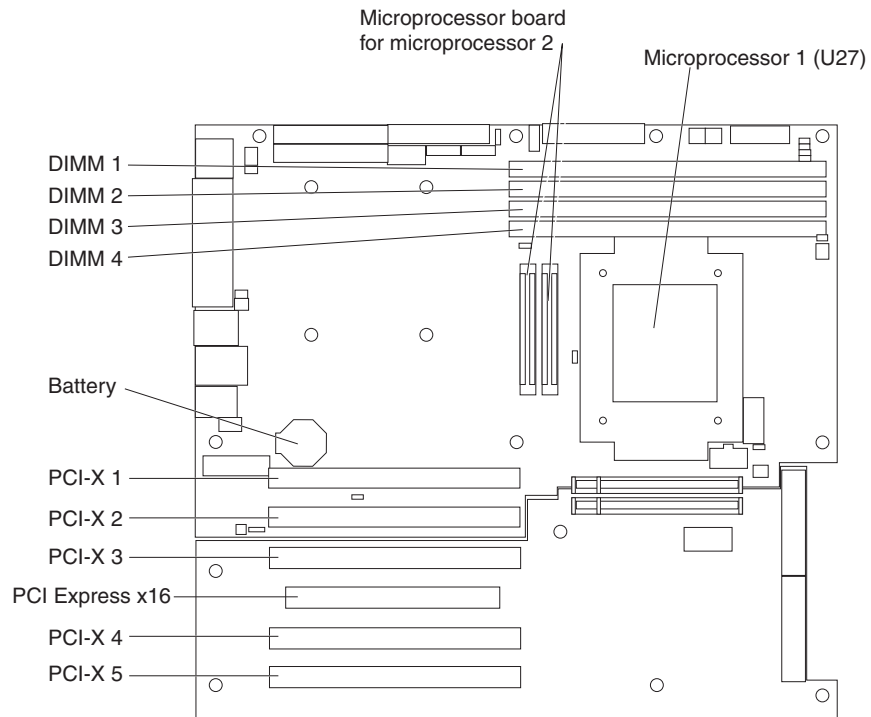
Major components of your computer

The following illustration shows the major components in the A Pro Type 6217 computer.



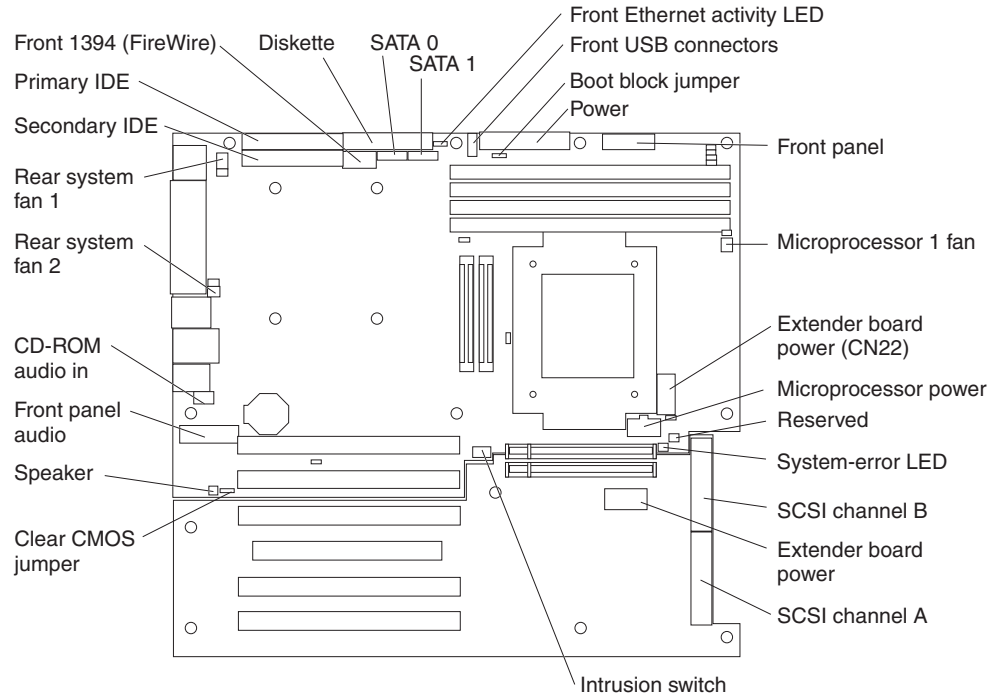
System-board option connectors

The following illustration shows the system-board connectors for user-installable options.



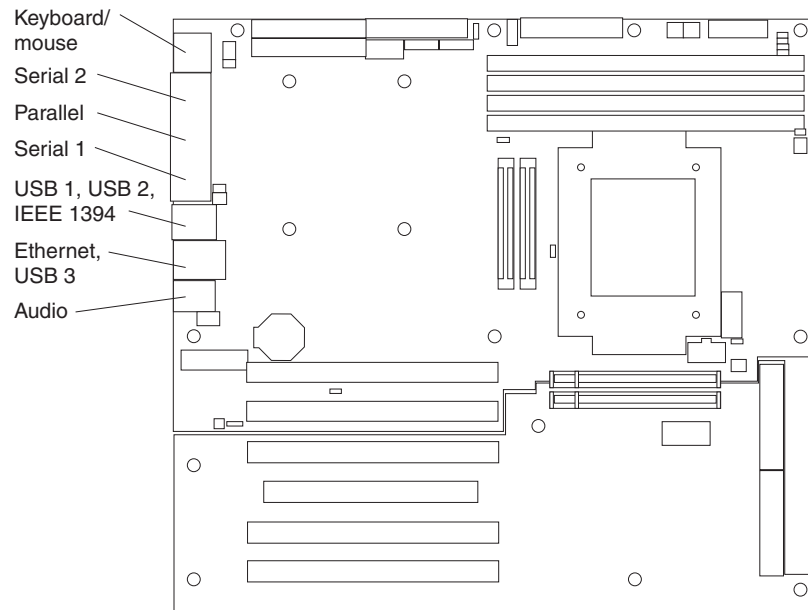
System-board internal connectors

The following illustration shows the internal connectors on the system board.



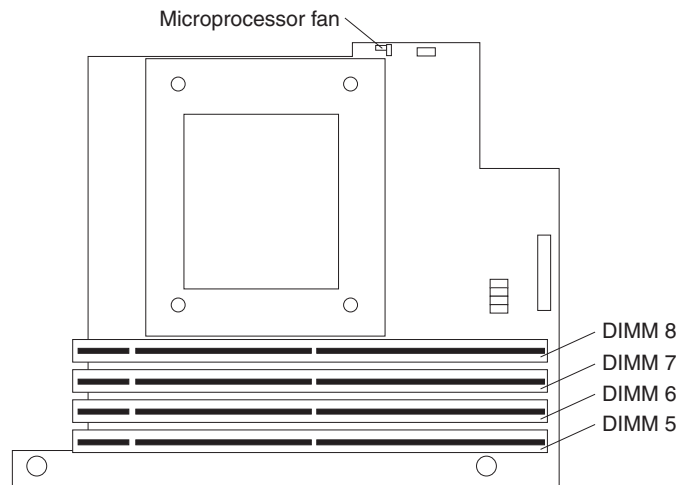
System-board external connectors

The following illustration shows the external input/output connectors on the system board.



Optional microprocessor board connectors

If you decide to add a second microprocessor to your computer, the microprocessor option kit includes a microprocessor board that you attach to the system board. The following illustration shows the connectors on the microprocessor board.

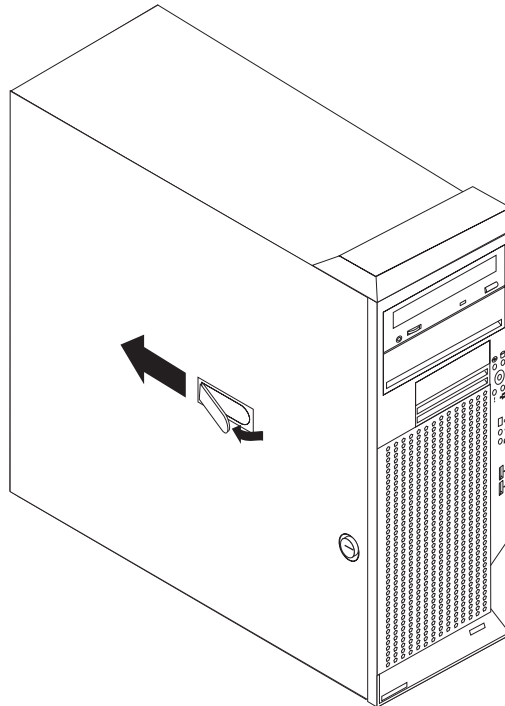


Removing the side cover

To remove the side cover, you might find it easier to lay the computer on its side.

To remove the side cover, complete the following steps:

1. Read the safety information beginning on page v. and the guidelines in “Handling static-sensitive devices” on page 34.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 19).
3. Disconnect all external cables and power cords.
4. Pull the cover-release latch away from the computer, and push the cover toward the rear of the computer. Lift the side cover off the computer and set it aside.



For instructions for replacing the side cover, see “Replacing the side cover” on page 64.

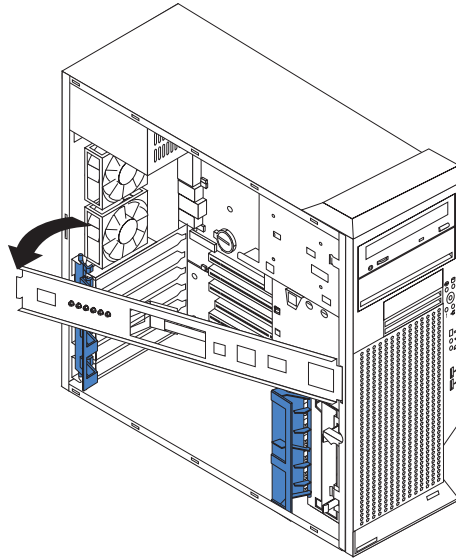
Attention: For proper cooling and airflow, replace the cover before turning on the computer. Operating the computer with the cover removed might damage computer components.

Removing and installing the support bracket

When working with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the support bracket to access the device.

To remove the support bracket, complete the following steps:

1. Read safety information beginning on page v and the guidelines in “Handling static-sensitive devices” on page 34.
2. Remove the side cover (“Removing the side cover” on page 39).
3. Pull out on the rear end of the support bracket approximately 150 mm (6 in.).
4. Disengage the front end of the support bracket from the computer and set the bracket aside.



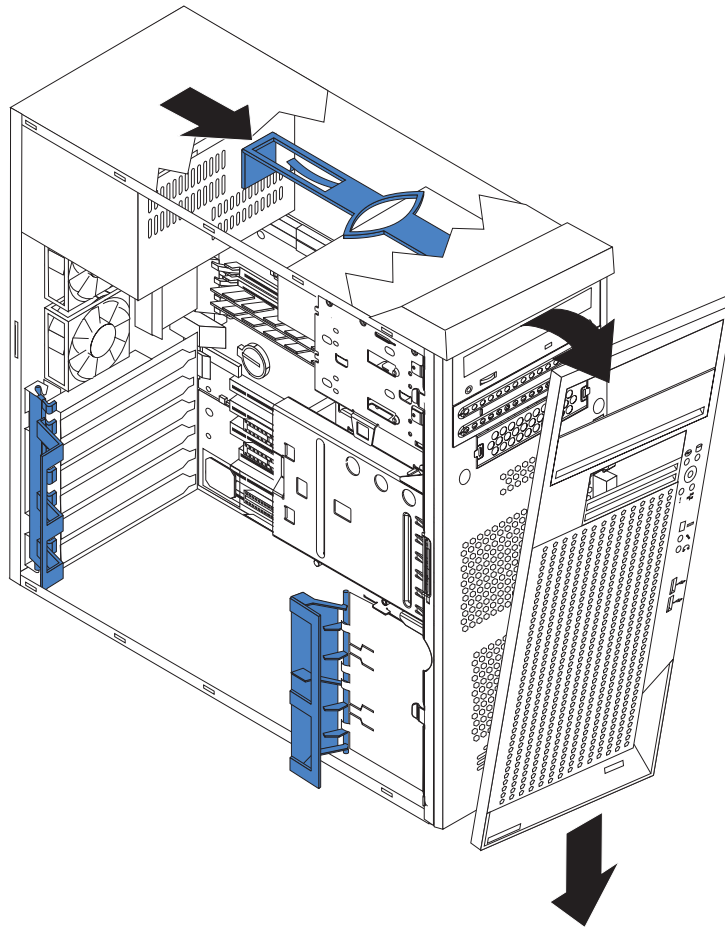
To reinstall the support bracket, reverse the previous steps.

Removing the bezel

When working with some devices, such as additional optical drives, you must first remove the bezel to access the device.

To remove the bezel, complete the following steps:

1. Unlock the side-cover lock.
2. Remove the side cover (see “Removing the side cover” on page 39).
3. Locate the bezel-release lever; then, press the bezel-release lever toward the front of the computer.



4. Pull the top of the bezel away from the chassis; then, push the bezel down to disengage the bottom tabs.
5. Remove the bezel from the computer and store the bezel in a safe place.

For instructions for replacing the bezel, see “Replacing the bezel” on page 64.

Installing an adapter

The following notes describe the types of adapters that your computer supports and other information that you must consider when installing an adapter. See “System-board option connectors” on page 36 for an illustration of the adapter slot locations.

- Read the documentation that comes with your operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- The computer comes with adapter connectors or *slots*. The video adapter is installed in the PCI Express x16 slot. You can install up to five additional adapters in your computer in PCI-X slots 1, 2, 3, 4, and 5.

Note: If you install the 3DLabs Wildcat Realizm 800 video adapter in the PCI Express x16 slot, it will overlap slot 4. Therefore, you will not be able to install an adapter in slot 4.

- The computer supports PCI Express x16 adapters, PCI-X adapters, 3.3 V PCI adapters, and universal PCI adapters.
- None of the PCI-X slots are hot-plug slots.
- You can install 64-bit or 32-bit adapters in PCI-X slots 1, 2, 3, 4, and 5.
- You can install full-length adapters in PCI-X slots 1, 3, 4, and 5; PCI-X slot 2 supports two-third length adapters.

Note: If you install the 3DLabs Wildcat Realizm 800 video adapter in the PCI Express x16 slot, it will overlap slot 4. Therefore, you will not be able to install an adapter in slot 4.

- If you install a ServeRAID 6i+ adapter, it must be installed in slot 3.
- The computer scans the PCI Express x16 slot and PCI-X expansion slots to assign system resources. Then, it starts the PCI devices in the following order, if you have not changed the default startup sequence: PCI Express x16 slot; PCI-X expansion slot 1; system-board integrated drive electronics (IDE), Serial ATA (SATA), or small computer system interface (SCSI) devices; and then PCI-X slots 2 through 6.
- For a list of supported options for your computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for your computer.

To install an adapter, complete the following steps:

1. Read the safety information beginning on page v and the guidelines in “Handling static-sensitive devices” on page 34.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 19); then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 39).
4. Determine which PCI-X slot you will use for the adapter. Review the instructions that come with the adapter for any requirements, restrictions, or cabling instructions. It might be easier to route cables before you install the adapter.
5. For full-length adapters, rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the computer. Rotate the front adapter-retention bracket to the open position. If you are installing a smaller adapter, remove only the rear adapter-retention bracket.

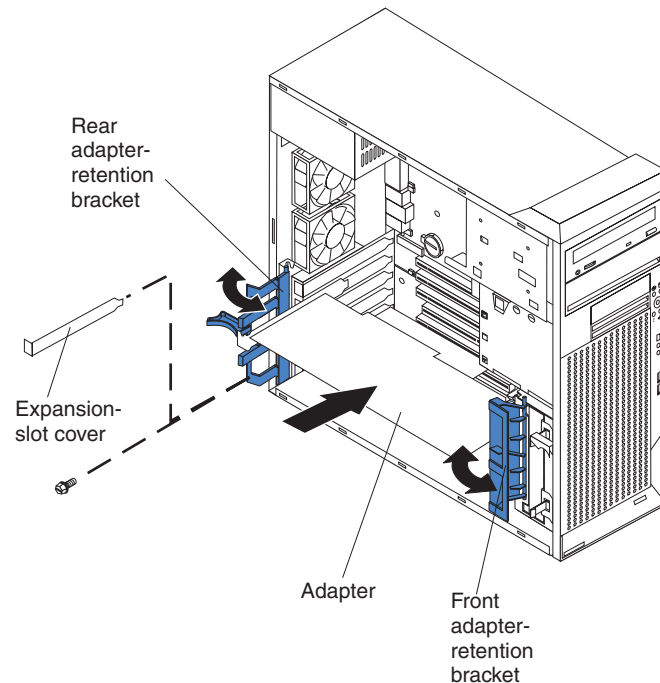
6. If there is an adapter already installed in the slot, remove it and place it on a static-protective surface.

If the slot is empty, remove the expansion-slot cover. From the rear of the computer, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

Attention: Expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions standards of the computer and ensures proper ventilation of computer components.

7. Follow the instructions that come with the adapter to set jumpers or switches, if any.
8. Remove the adapter from the static-protective package, carefully grasp the adapter by the top edge or upper corners, and align it with the expansion slot guides; then, press the adapter *firmly* into the expansion slot. Move the adapter directly from the static-protective package to the adapter slot. Avoid touching the components and gold-edge connectors on the adapter.

Attention: Make sure that the adapter is correctly seated in the expansion slot before you turn on the computer. Incomplete installation of an adapter might damage the system board or the adapter.



9. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans. If you are installing an optional SCSI adapter, see “Cabling an optional SCSI adapter” on page 44 for additional information.
10. If you have another adapter to install, repeat steps 4 through 9.
11. If you have installed a full-length adapter, rotate the front adapter-support bracket to the closed (locked) position.

Note: If any adapter in your computer is large or has heavy cables attached to it, you can secure the adapter with a screw: insert one backup expansion-slot screw (stored on the frame-support bracket) through the top of each adapter bracket into the screw hole and secure the adapter before proceeding to the next step. If you use a screw to secure an adapter, you will have to secure all

adapters with screws. You cannot use both the screws and the retention brackets to secure adapters. You must use one method or the other.

12. Reinstall the rear adapter-retention bracket; then, rotate the bracket to the closed (locked) position.

Note: The rear retention bracket rests against the computer side cover. You might find it easier to lay the computer on its side to replace the side cover.

13. If you have other options to install, do so now; otherwise, continue with step 14.
14. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
15. Replace the side cover (see “Replacing the side cover” on page 64).
16. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Cabling an optional SCSI adapter

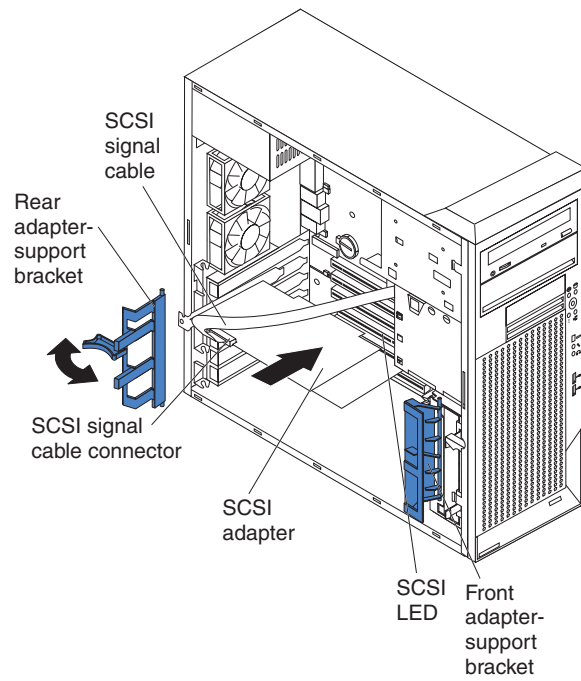
You can install an optional SCSI adapter in your computer to control the internal hard disk drives and provide additional RAID capabilities. With a SCSI adapter installed, you can configure the internal hard disk drives into disk arrays. You can also cable a SCSI adapter to external hard disk drives. See your SCSI adapter option documentation for complete instructions for installing a SCSI adapter in your computer and for additional information about SCSI adapters.

The following notes describe information that you must consider when cabling an optional SCSI adapter.

- The SCSI cables that are used by the integrated SCSI controller cannot be used with an optional SCSI adapter.
- If you install a ServeRAID 6i+ adapter, it must be installed in slot 3; no cabling is required for this adapter.

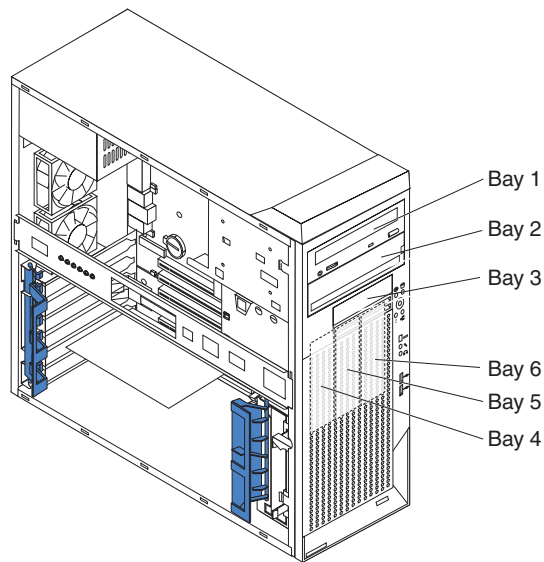
To cable an optional SCSI adapter, complete the following steps:

1. Install the SCSI adapter.
2. Connect the SCSI-signal cable to the adapter and to one or more of the signal-cable connectors on the rear of the SCSI devices.



3. Complete the installation of the optional SCSI adapter.

Installing internal drives



The following notes describe the types of drives that your computer supports and other information that you must consider when installing internal drives.

- Your IntelliStation A Pro computer comes with an IDE optical drive (CD-ROM, CD-RW, DVD-ROM, DVD/CD-RW combo, or DVD-RAM Multiburner Plus drive) in bay 1 and a hard disk drive in bay 4.
- You can install removable-media drives in bays 1, 2, and 3 only. Tape drives, diskette drives, CD-ROM, DVD/CD-RW, DVD-ROM, DVD/CD-RW combo, or DVD-RAM Multiburner Plus drives are examples of removable-media drives.
- You can install a 3.5-in. slim-high or 5.25-in. half-high removable-media drive, such as a tape backup drive, in bay 2.
- You can install an IDE diskette drive or a 3.5-in slim-high hard disk drive in bay 3.
- To install a 3.5-in. drive in a 5.25-in. bay, you must use the 5.25-in. conversion kit.
- The IntelliStation A Pro computer supports only one diskette drive: either an IDE diskette drive in bay 3 or a USB drive connected to the USB connector on the front of the computer.
- If you plan to install a Microsoft Windows XP 32-bit operating system on a SCSI drive, you must have a diskette drive attached during installation to be able to load the SCSI driver.
- Two Serial ATA hard disk drive connectors are on the system board.
- When SCSI drives are installed, set the drive jumpers either to disable auto-start or to delay startup, to prevent overtaxing the system power supply by all drives trying to spin up at once.
- If you have SCSI hard disk drives and SATA hard disk drives in the same computer, note the following HostRAID considerations for hard disk drives:
 - You can enable HostRAID on only one subsystem (SCSI or SATA)
 - If HostRAID is enabled on a subsystem, you can install boot hard disk drives on that subsystem only.

If you fail to observe these restrictions, the computer will usually disable the BIOS for the last subsystem loaded, which typically is SCSI.

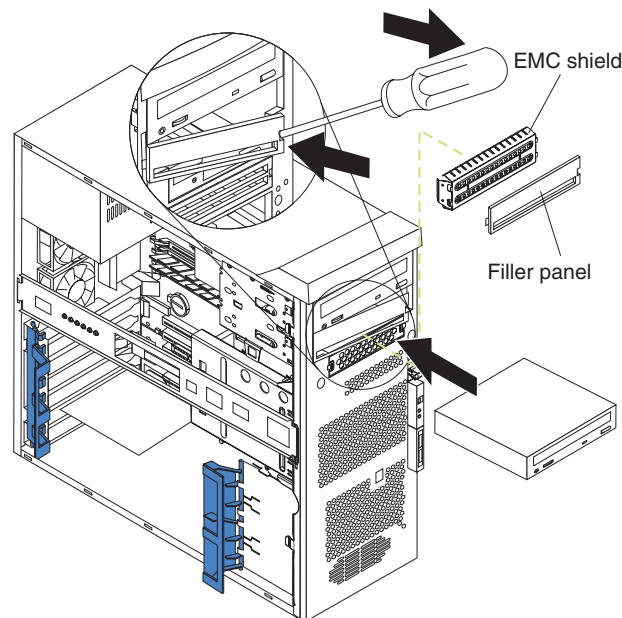
For more information about HostRAID, see “Using the Adaptec HostRAID configuration programs” on page 25.

- The electromagnetic interference (EMI) integrity and cooling of the computer are protected by having all bays and PCI-X slots covered or occupied. When you install a drive or PCI-X adapter, save the EMC shield and filler panel from the bay or the PCI-X adapter slot cover in the event you later remove the drive or adapter.
- For a complete list of supported options for your computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for your computer.

Installing a drive in bay 2

To install a drive in bay 2, complete the following steps:

1. Read the safety information beginning on page v, the guidelines in “Handling static-sensitive devices” on page 34, and the documentation that comes with your drive.
2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see “Removing the side cover” on page 39).
6. Remove the front bezel (see “Removing the bezel” on page 41).
7. Remove the support bracket (see “Removing and installing the support bracket” on page 40).
8. Use a screwdriver to pry the filler panel and EMC shield away from the computer.



Note: If you are installing a drive that contains a laser, review the following safety precaution.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

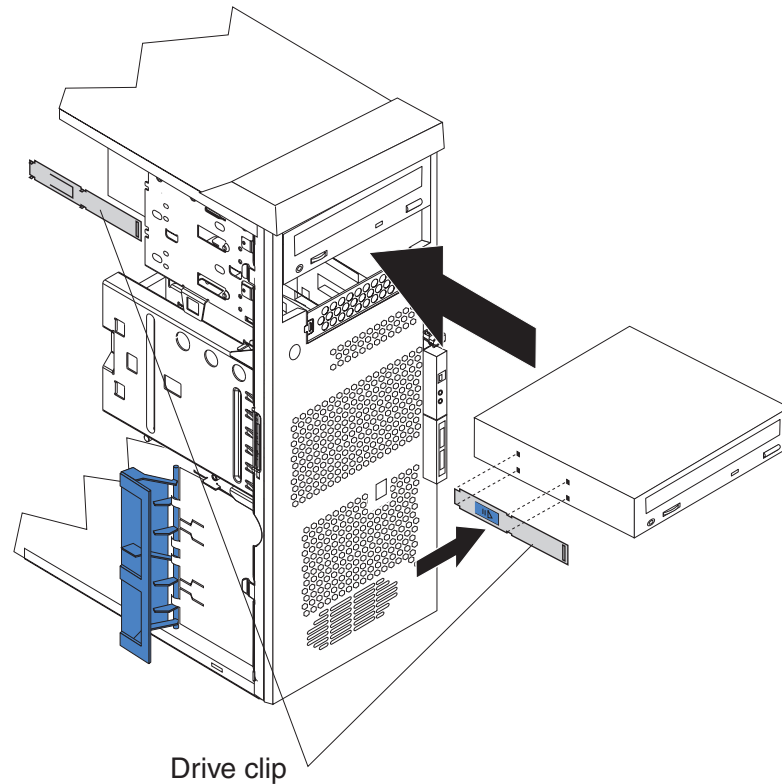
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

9. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
10. Follow the instructions that come with the drive to set jumpers or switches, if any.

Note: You might find it easier to install the new drive into the opening on the front and then attach the cables.

11. If you are installing a 3.5-in. drive in bay 2, attach a 5.25-in. conversion kit to the 3.5-in. drive.
12. Remove the clip from the side of the drive cage of bays 1 and 2 by sliding the clip to the left; then, snap the clip into the screw holes on the side of the drive or conversion kit (the blue side of the clip should be facing outward).



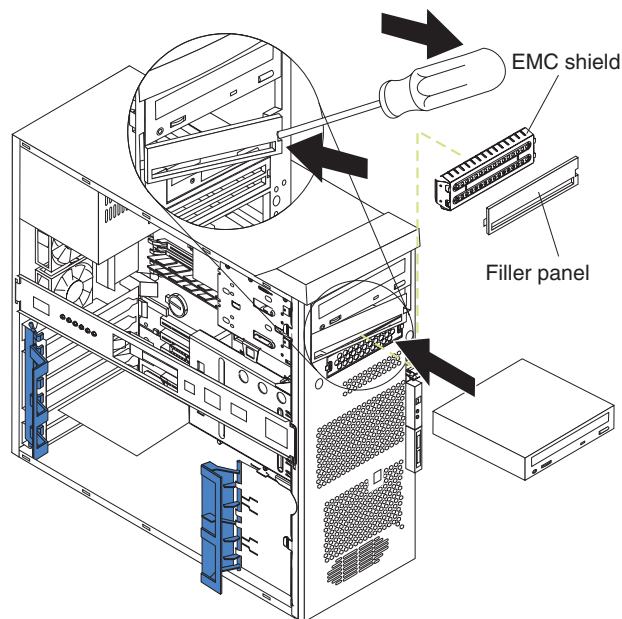
13. Push the drive into the bay.
14. Determine whether the drive is an IDE or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable IDE or SCSI connector on the system board. See “Power and signal cables for internal drives” on page 54 for additional information about cabling drives and “System-board internal connectors” on page 37 for the location of IDE and SCSI connectors on the system board. If there are open connectors on the cables connecting existing IDE or SCSI drives, you can use these cables to connect the new drive.
15. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.
16. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
17. If you have other options to install or remove, do so now.
18. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
19. Replace the bezel (see “Replacing the bezel” on page 64).
20. Replace the side cover (see “Replacing the side cover” on page 64).
21. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Installing a drive in bay 3

Note: Only a 3.5-in. device can be installed in bay 3.

To install a drive in bay 3, complete the following steps:

1. Read the safety information beginning on page v, the guidelines in “Handling static-sensitive devices” on page 34, and the documentation that comes with your drive.
2. Make sure that you have all the cables and other equipment specified in the documentation that comes with the drive.
3. Check the instructions that come with the drive to determine whether you need to set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
4. Turn off the computer and all attached devices; then, disconnect all external cables and power cords.
5. Remove the side cover (see “Removing the side cover” on page 39).
6. Remove the front bezel (see “Removing the bezel” on page 41).
7. Remove the support bracket (see “Removing and installing the support bracket” on page 40).
8. Use a screwdriver to pry the filler panel and EMC shield away from the computer.



Note: If you are installing a drive that contains a laser, review the following safety precaution.

Statement 3:



CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

9. Touch the static-protective package containing the drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
10. Follow the instructions that come with the drive to set jumpers or switches, if any.

Notes:

- a. You might find it easier to install the new drive into the opening on the front and then attach the cables.
 - b. If you are installing a hard disk drive, you might need to temporarily disconnect the front-panel cable from the system board. You can reconnect the front-panel cable after you have finished installing the hard disk drive.
11. Push the drive into the bay; then, use the two screws to attach the drive to the drive cage.
 12. Determine whether the drive is an IDE or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable IDE or SCSI connector on the system board (if you are installing a diskette drive in bay 3, connect the other end of the cable to the diskette connector on the system board). See "Power and signal cables for internal drives" on page 54 for additional information about cabling drives and "System-board internal connectors" on page 37 for the location of diskette, IDE, and SCSI connectors on the system board. If there are open connectors on the cables connecting existing IDE or SCSI drives, you can use these cables to connect the new drive.

13. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor.
14. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
15. If you have other options to install or remove, do so now.
16. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
17. Replace the bezel (see “Replacing the bezel” on page 64).
18. Replace the side cover (see “Replacing the side cover” on page 64).
19. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Installing a hard disk drive in bay 4, 5, or 6

Bays 4, 5, and 6 are in the drive cage. The drive cage is behind the front of the adapter-support bracket.

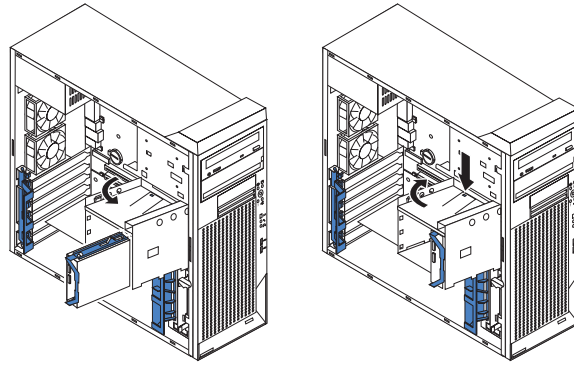
Note: When installing options, you might find it easier to work with the computer lying on its side.

To install a drive in bay 4, 5, or 6, complete the following steps:

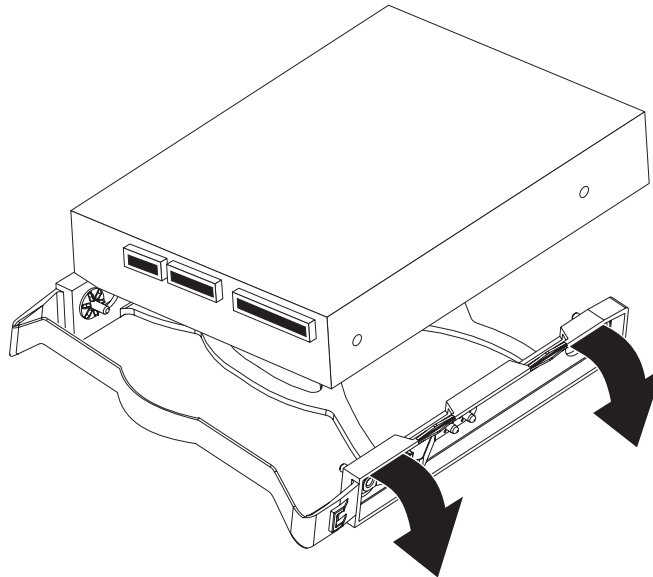
1. Read the safety information beginning on page v, the guidelines in “Handling static-sensitive devices” on page 34, and the documentation that comes with your drive.
2. Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
3. Select the bay in which you want to install the drive.
4. Check the instructions that come with the drive to determine whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, make sure that you set the SCSI ID for that device.
5. Turn off the computer and all attached devices (see “Turning off the computer” on page 19); then, disconnect all power cords and external cables.
6. Remove the side cover (see “Removing the side cover” on page 39).
7. Remove the support bracket (see “Removing and installing the support bracket” on page 40).
8. Grasp the drive cage and rotate the cage out of the computer until it locks into place with the drive-cage retention tab.

Note: You might need to disconnect the power cables from the drives before you rotate the cage all the way.

The open ends of the drive slots and installed drives will face you. Make sure that the drive cage locks into place over the drive-cage retention tab by rotating the drive cage all the way out of the computer.



9. If you are installing a new drive in an empty bay, slide the existing drive tray out of the drive bay. If you are replacing a drive, complete the following steps:
 - a. Slide the existing drive out of the drive bay.
 - b. Remove the drive from the drive tray by gently pulling both sides of the drive tray outward until the mounting pins are disengaged from the holes on the drive; then, lift the drive out of the drive tray.



10. Touch the static-protective package containing the new drive to any unpainted metal surface on the computer; then, remove the drive from the package and place it on a static-protective surface.
11. Set any jumpers or switches on the new drive according to the documentation that comes with the drive.
12. Attach the new drive to the drive tray. Place the drive on the drive tray and align the holes on the drive with the mounting pins on the drive tray. Gently pull both sides of the drive tray outward and insert the mounting pins into the holes on the drive.
13. Slide the drive into the drive bay until the drive snaps into place.
14. Determine whether the drive is a Serial ATA or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and the other end of this cable into the applicable Serial ATA or SCSI connector on the system board. If there are open connectors on the cables connecting existing Serial ATA or SCSI drives, you can use these cables to connect the new drive. See “Power and signal cables for internal drives” on page 54 for additional

information about cabling drives and “System-board internal connectors” on page 37 for the location of Serial ATA and SCSI connectors on the system board.

15. Route the signal cable so that it does not block the airflow to the rear of the drives or over any microprocessor.
16. Connect the power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
17. Push the drive cage outward, and press in on the drive-cage release tab. Rotate the cage part-way into the computer; then, reconnect any power cables you disconnected in step 8 and rotate the cage the rest of the way back into the computer. Make sure that the drives and cables do not strike the microprocessor fan sink.
18. If you have other options to install or remove, do so now.
19. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
20. Replace the side cover (see “Replacing the side cover” on page 64).
21. Reconnect the external cables and power cords; then, turn on the attached devices and the computer.

Power and signal cables for internal drives

Your computer uses cables to connect IDE, Serial ATA, and SCSI devices to the power supply and to the system board. (See “System-board internal connectors” on page 37 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in your computer come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive, or label the cables.
- When you install a drive, make sure that one of the drive connectors of the signal cable is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- When you install a drive, set the jumpers either to disable auto-start or to delay startup, to prevent the system power supply from being overtaxed by all drives trying to spin up at once.
- The computer has two IDE buses, primary and secondary. Each of these buses supports up to two IDE devices. The primary IDE bus uses connector IDE1 on the system board and the secondary IDE bus uses connector IDE2.
- If you have only one IDE device on a cable, it must be set as a master device.
- If two IDE devices are used on a single cable, one must be designated as the master device and the other as the subordinate device; otherwise, the computer might not recognize some of the IDE devices. The master and subordinate designation is determined by switch or jumper settings on each IDE device.

The following cables are provided:

- **Power cables:** Four-wire power cables connect the drives to the power supply. At the end of these cables are plastic connectors that can be attached to different drives; these connectors vary in size. With Serial ATA drives, you can use either a four-wire power cable or a five-wire Serial ATA power cable, but do not use both at the same time (use one or the other).
- **Signal cables:** Signal cables typically are flat cables, also called ribbon cables, that connect IDE, SATA, SCSI, and diskette drives to the system board. Two or three types of signal cable come with your computer:

- **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary or secondary IDE connector on the system board. The spare connector can be used to connect additional IDE drives to your computer.

Note: The optical drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is connected to the system board. The black connector is connected to the master IDE device. The gray middle connector is connected to the subordinate IDE device.

- **Serial ATA:** The narrower, black signal cable has two connectors. One is connected to the SATA drive, and the other is connected to the connector on the system board. Each SATA drive comes with a cable. If you install an additional SATA drive, you will need an additional cable.
- **SCSI:** The following cables can be used to attach SCSI devices to the integrated SCSI controller on the system board:
 - An Ultra320 twisted ribbon cable connects the internal Ultra320 SCSI hard disk drive to the SCSI connector on the system board. This cable has four additional connectors for attaching more internal SCSI devices.
 - A round SCSI cable connects external SCSI devices to the integrated SCSI controller (SCSI B) on the system board. For more information about connecting SCSI devices, see the SCSI documentation.

Installing memory modules

The following notes describe the types of dual inline memory modules (DIMMs) that your computer supports and other information that you must consider when installing DIMMs:

- The computer must have at least one pair of DIMMs installed in the DIMM connectors for each microprocessor installed.
- The system board contains four DIMM connectors for microprocessor 1. Your computer comes with one pair of DIMMs installed in the DIMM connectors on the system board.
- If you install a second microprocessor, the board that comes with the microprocessor option (microprocessor board) contains four DIMM connectors for microprocessor 2. You must install at least one pair of DIMMs in the DIMM connectors on the microprocessor board.
- You can add a second pair of DIMMs for either microprocessor at any time. It is not necessary to add a second pair of DIMMs for microprocessor 1 before adding a second pair of DIMMs for microprocessor 2.
- The DIMM options that are available for your computer are 512 MB, 1 GB, and 2 GB. The PC2700 DIMMs are available in 2 GB only. The computer supports a minimum of 1 GB and a maximum of 16 GB of system memory.

Note: Although your computer supports a maximum of 16 GB of system memory, the Microsoft Windows XP operating systems recognize and support a maximum of 4 GB of system memory.

- The computer comes with two 512 MB or 1 GB memory DIMMs installed.
- Install only 2.5 V, 184-pin, double-data-rate (DDR), PC2700 (2 GB DIMMs only) or PC3200, registered, buffered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2700 or PC3200 SDRAM, registered, buffered DIMM specification. For a list of supported options for your computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for your computer.

- DIMMs must be installed in matched pairs. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. You can mix compatible DIMMs from various manufacturers.
- The first pair of DIMMs on the system board are installed in DIMM connectors 1 and 2. If you install a second pair of DIMMs for microprocessor 1, install the pair in DIMM connectors 3 and 4. The following illustration shows the system board DIMM installation sequence.

Installation sequence on system board	
DIMMs	Slots
First pair of DIMMs	1, 2
Second pair of DIMMs	3, 4

- If you install a second microprocessor (microprocessor 2), install the first pair of DIMMs for the microprocessor in DIMM connectors 5 and 6 on the microprocessor option board. If you install a second pair of DIMMs for the microprocessor, install the pair in DIMM connectors 7 and 8 on the microprocessor board. See “Installing a second microprocessor” on page 58 for more information about the microprocessor option. The following illustration shows the microprocessor board DIMM installation sequence.

Installation sequence on microprocessor board	
DIMMs	Slots
First pair of DIMMs	5, 6
Second pair of DIMMs	7, 8

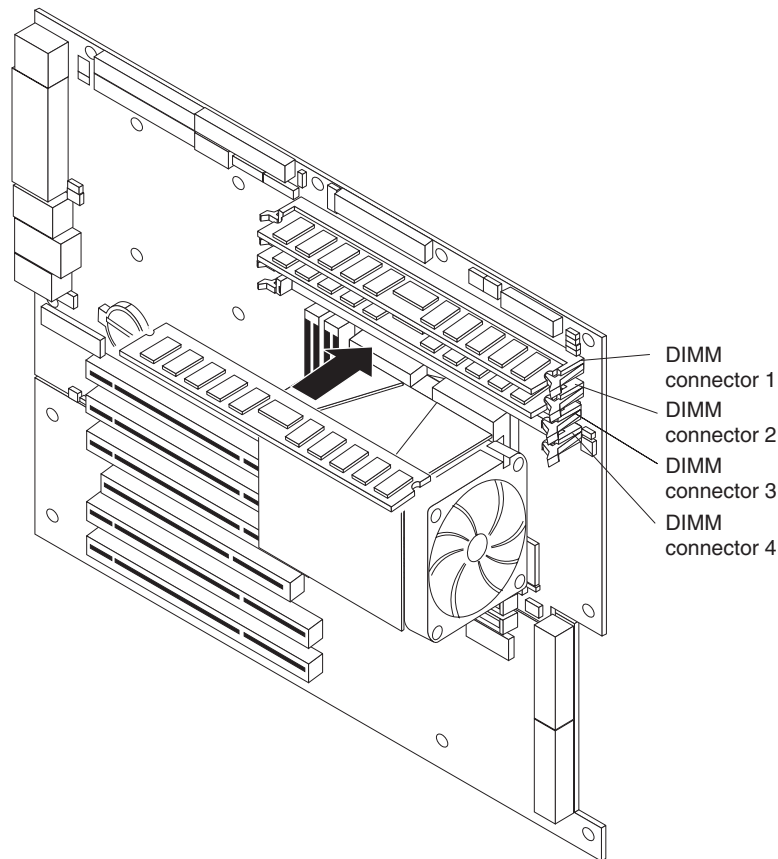
- Your computer supports two-way memory interleaving across the memory banks for each microprocessor.
- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS will display the total amount of installed memory and the amount of configured memory. To obtain a full 16 GB or more of usable memory, you must install a second microprocessor and memory.
- When you restart the computer after adding or removing DIMMs, the computer displays a message that the memory configuration has changed.

To install DIMMs, complete the following steps:

1. Read the safety information beginning on page v, and the guidelines in “Handling static-sensitive devices” on page 34.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 19); then, disconnect all external cables and power cords.
3. Remove the side cover (see “Removing the side cover” on page 39).
4. Remove the support bracket (see “Removing and installing the support bracket” on page 40).
5. For easier access to the memory modules on the system board, rotate the drive cage out of the computer until it locks into place. You might need to disconnect the power cables from the drives before you rotate the cage all the way.

Note: If you are installing memory modules on the microprocessor board for a second microprocessor on the computer, it is not necessary to move the drive cage.

6. If you are installing DIMMs for microprocessor 1, and you have installed a second microprocessor in the computer, remove the microprocessor 2 air baffle:
 - a. Lift up on the large end of the baffle until it releases.
 - b. Slide the baffle toward the front of the computer; then, lift the baffle out of the computer.
7. Locate the DIMM connectors. Determine the connectors into which you will install the DIMMs. See the notes on page 56 for the installation sequence.
8. Gently open the retaining clips on each end of the DIMM connectors you have selected and, if necessary, remove any existing DIMMs.
9. Touch the static-protective package containing the new DIMM to any unpainted metal surface on the computer. Then, remove the new DIMM from the package.
10. Turn the DIMM so that the contacts align correctly with the connector.
11. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.



12. Repeat steps 8 through 11 for the second DIMM in the pair.
13. If you have other options to install or remove, do so now.
14. If you moved the drive cage out of the way in step 5, push the drive cage outward and press in on the drive-cage release tab. Rotate the cage part-way

into the computer, reconnect any power cables you disconnected from the drives, and rotate the cage the rest of the way back into the computer.

15. If you removed the air baffle for the optional second microprocessor in step 6, replace the air baffle.
16. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
17. Replace the side cover (see “Replacing the side cover” on page 64).
18. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

Installing a second microprocessor

Your computer supports a second microprocessor. The second microprocessor comes on a separate microprocessor board, with its own memory modules.

Note: When installing options, you might find it easier to work with the computer lying on its side.

The following notes describe information that you must consider when installing a second microprocessor in your computer.

- Microprocessor 1 and 2 must be identical (for example, the clock speed, cache size, clock frequencies, and number of cores).
- The microprocessor option kit comes with a microprocessor board, a microprocessor socket, the microprocessor, a fan sink, and a microprocessor air baffle. The necessary screws and the microprocessor socket are preinstalled on the microprocessor board.
- Each microprocessor contains a memory controller for the memory modules that are associated with it.
- You must install at least one pair of matched DIMMs on the microprocessor board with the microprocessor. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match other pairs. See “Installing memory modules” on page 55 for information about the installation order and the type of DIMMs that are supported.
- With more than one microprocessor, the computer can operate as a symmetric multiprocessing (SMP) computer. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors. This enhances performance for database and other applications.
- To use SMP, obtain an SMP-capable operating system. For a list of supported operating systems, go to <http://www.ibm.com/pc/us/compat/>.
- Read the documentation that comes with the microprocessor to determine whether you need to update the computer basic input/output system (BIOS) code. The most current level of BIOS code for the computer is available from <http://www.ibm.com/pc/support/>.
- For a list of supported microprocessor options for your computer, go to <http://www.ibm.com/pc/>; then, select your country and navigate to the list of options for your computer

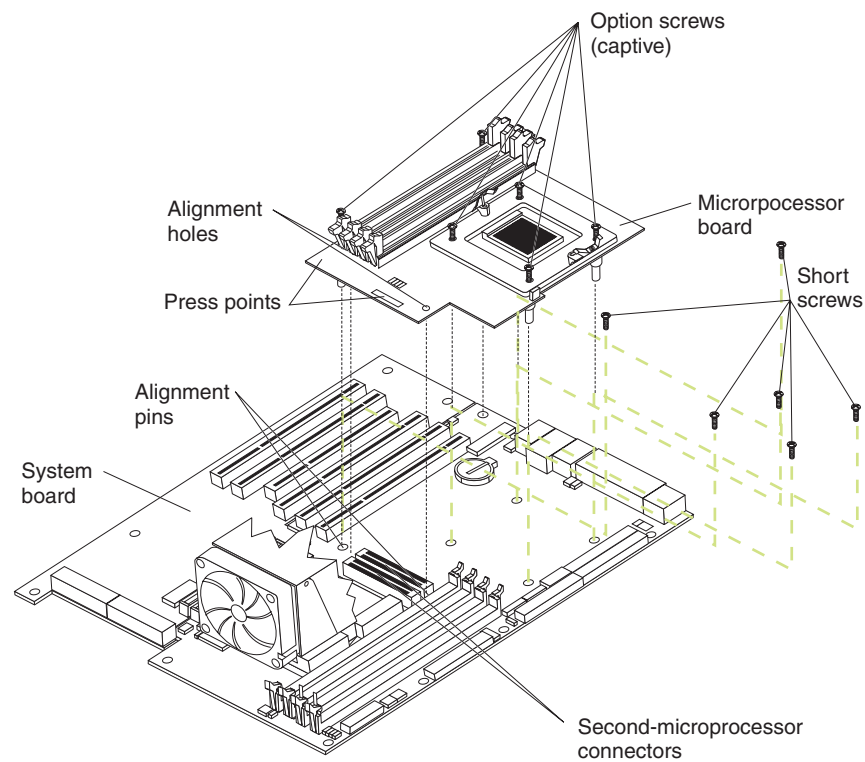
Before you begin, obtain the following items:

- A Phillips-head screwdriver
- A flat-blade screwdriver or a nut driver

To install a second microprocessor, complete the following steps.

Note: For clarity, the illustrations in this procedure show only the system board. You will not remove the system board from the computer to perform this procedure.

1. Read the safety information beginning on page v, and the guidelines in “Handling static-sensitive devices” on page 34.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 19).
3. Disconnect all external cables and power cords; then, remove the side cover (see “Removing the side cover” on page 39.)
4. Remove the support bracket (see “Removing and installing the support bracket” on page 40).
5. Remove the rear adapter-retention bracket.
6. Touch the static-protective package containing the microprocessor board to any unpainted metal surface on the computer. Then, remove the microprocessor board from the package.

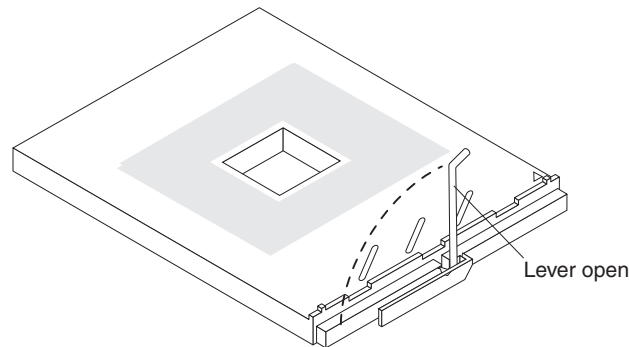


7. Remove the six indicated screws from the system board.
8. Position the alignment holes in the microprocessor board over the two plastic alignment pins on the system board; then, lower the microprocessor board onto the alignment pins.

Notes:

- a. When lowering the microprocessor board onto the two plastic alignment pins, it might help to hold it by one of the DIMM slot tabs and one of the retention spring clips.
- b. The screws on the microprocessor board are spring-loaded. When the microprocessor board is correctly in place, the screws will stick straight down and align with the six screw holes on the system board.
- c. Make sure that the connectors on the underside of the microprocessor board line up with the second-microprocessor connectors on the system board.

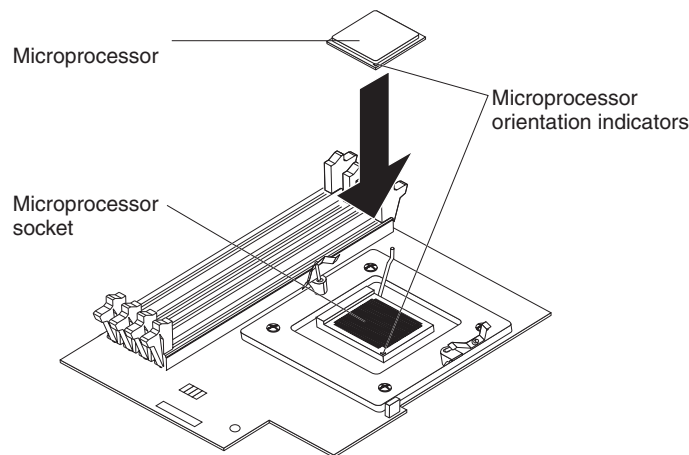
9. Tighten the four screws on the fan-sink socket; then, tighten the two screws on the corners of the microprocessor board to secure the microprocessor board to the system board.
- Attention:** When you tighten the screw on the microprocessor board that is closest to the rear fan in computer, you might have to push the rear fan slightly to the side.
10. Press down on the barcode label and the indicated corner to make sure that the microprocessor board is firmly seated in the connectors on the system board.
 11. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if any is present.
 12. Lift the microprocessor-release lever to the fully open position (90°).



Attention: You must make sure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.

13. Install the new microprocessor:
 - a. Touch the static-protective package containing the new microprocessor to any unpainted metal surface on the computer; then, remove the microprocessor from the package.
 - b. Position the microprocessor over the microprocessor socket as shown in the following illustration. Carefully press the microprocessor into the socket.

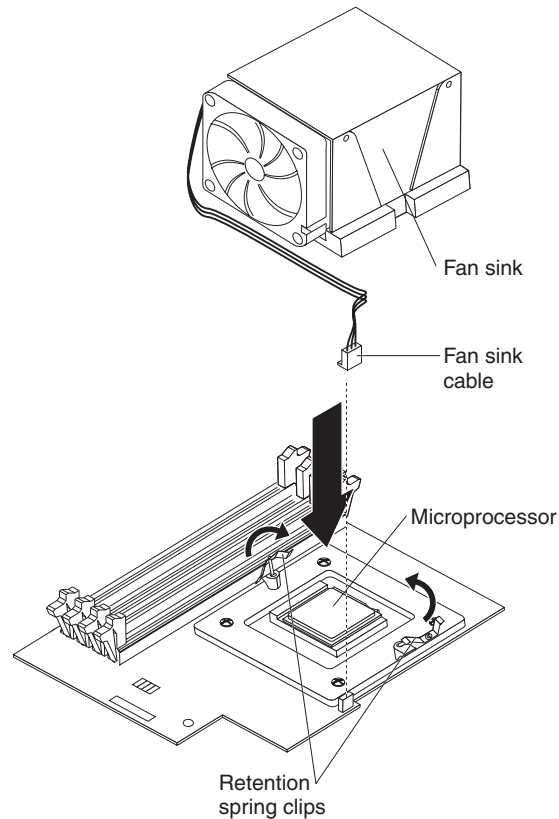
Attention: To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.



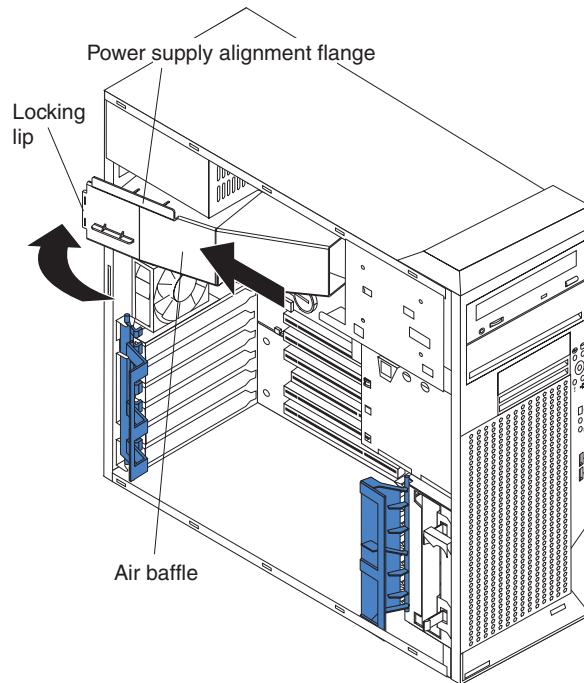
14. Close the microprocessor-release lever to secure the microprocessor.

Attention:

- Do not disturb or contaminate the grey thermal material on the bottom of the new fan sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.
 - If you need to remove the fan sink after installing it, call for service.
15. Install the fan sink.



- Make sure that the two retention spring clips on the microprocessor retention bracket (on the microprocessor board) are open and rotated to either side as shown in the above illustration.
 - Remove the fan sink from its package and remove the cover from the bottom of the fan sink. Make sure that the thermal material is still on the bottom of the fan sink.
 - Remove the release liner and orient the fan sink above the microprocessor.
 - Make sure that you install the fan sink toward the rear of the computer so that the front of the fan sink and the fan-sink screws do not come in contact with any electrical components on the microprocessor board.
 - Connect the fan-sink cable to the microprocessor fan connector on the microprocessor board; then, press the fan sink into place (see the illustration in “Optional microprocessor board connectors” on page 38 for the location of the connector).
 - Raise the retention spring clips into position on each side of the fan sink. Start both screws into the fan-sink socket; then, tighten both screws. Do not overtighten the screws.
16. Install at least one pair of supported DIMMs on the microprocessor board. See “Installing memory modules” on page 55 for information about the installation order and the type of supported DIMMs.
17. Install the microprocessor air baffle.



- a. Orient the air baffle as shown and align it with the side of the power supply.
 - b. Insert the small end of the baffle into the computer toward the front of the computer.
 - c. Lower the larger end of the baffle until the side flange rests on the power supply.
 - d. Slide the baffle toward the rear of the computer until it stops and the rear flange (locking lip) is inside the computer chassis; then, press down on the large end of the baffle until it clicks into place.
18. If you have other options to install or remove, do so now.
 19. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
 20. Replace the side cover (see “Replacing the side cover” on page 64).
 21. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

Installing an external SCSI cable

To install an external SCSI connector on the rear of the computer, install an external SCSI interface option. For a list of supported external SCSI interface options for your computer, go to <http://www.ibm.com/pc/>.

The external SCSI interface option contains a SCSI cable with a connector at one end and on the other end another connector or an expansion-slot cover with an embedded connector. Complete the following steps to install and route the SCSI cable in the computer:

1. Turn off the computer and all peripheral devices. Disconnect all power cords; then, disconnect all external signal cables from the computer.
2. Remove the computer cover (see “Removing the side cover” on page 39).
3. Remove the support bracket (see “Removing and installing the support bracket” on page 40).

4. Open the front adapter-retention bracket and remove the rear adapter-retention bracket from the PCI-X slots (see “Installing an adapter” on page 42 for instructions). You might also have to remove longer adapters for access to the SCSI connectors on the system board.
5. Connect the SCSI signal cable end labeled “PLANAR” to the connector for SCSI channel B on the system board. See “System-board internal connectors” on page 37 for the location of the SCSI channel B connector.
6. Route the SCSI cable between the chassis and PCI-X slot 5 to the back of the computer. Make sure the cable does not block the flow of air to the microprocessors or hard disk drives.
7. Attach the external connector to the rear of the computer.
 - If the external end of the SCSI cable has a standard SCSI connector, complete the following steps:
 - a. Remove the SCSI-connector knockout from the rear of the computer.
 - b. Insert the external SCSI connector on the SCSI cable into the knockout opening and secure it with the attached screws.
 - If the external end of the SCSI cable has an expansion-slot cover with an embedded connector, complete the following steps:
 - a. Remove an expansion-slot cover from an available PCI-X slot.
 - b. Insert the expansion-slot cover with embedded connector into the slot opening.
8. Replace any adapters you removed in step 4. Close the front adapter-retention bracket and replace the rear adapter-retention bracket.
9. Replace the support bracket (see “Removing and installing the support bracket” on page 40).
10. Replace the cover (see “Replacing the side cover” on page 64).
11. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.
12. Use the SCSISelect program to configure SCSI channel B (see “Using the SCSISelect Utility program (some models)” on page 30).

Installing a security rope clip

To help prevent hardware theft, you can add a security rope clip and cable to your computer. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.

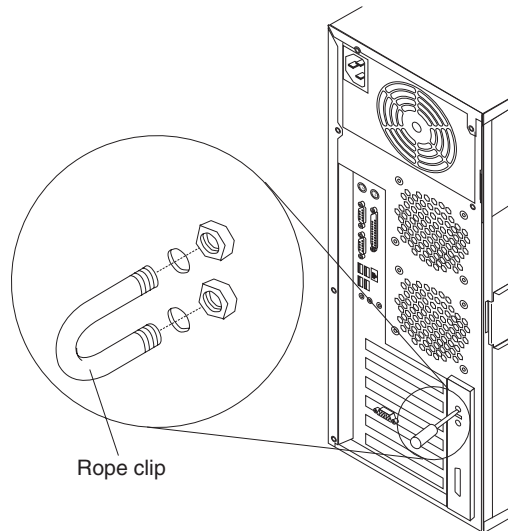
Before you begin, obtain the following items:

- A flat-blade screwdriver
- An adjustable wrench
- A 19 mm (0.75 in.) rope clip or wire rope (similar to National Manufacturing number 3230, stock number 176-735)
- Threaded nuts that fit the rope clip
- A security cable
- A lock, such as a combination lock or padlock

To install a rope clip, complete the following steps:

1. Turn off the computer and all attached devices.
2. Disconnect all external cables and power cords; then, remove the side cover. See “Removing the side cover” on page 39.
3. Use a screwdriver to remove the two metal knockouts.

4. Insert the rope clip through the rear panel; then, attach and tighten the nuts.
5. Thread the cable through the rope clip and around an object that is not part of or permanently secured to the building structure or foundation and from which the cable cannot be removed. Fasten the cable ends together with a lock. After you add the security cable, make sure that it does not interfere with other cables that are connected to the computer.



6. If you have other options to install or remove, do so now; otherwise, replace the side cover (see “Replacing the side cover”).
7. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

Replacing the bezel

To replace the bezel, complete the following steps:

1. Insert the two tabs on the bottom of the bezel into the matching holes on the computer chassis.
2. Push the top of the bezel toward the computer until the two tabs at the top of the bezel snap into place.

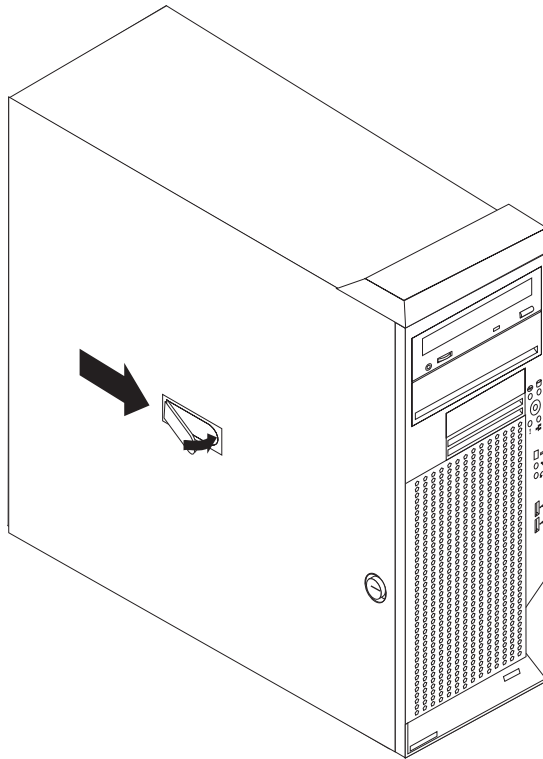
Replacing the side cover

If you removed the support bracket, reinstall it before you replace the side cover. See “Removing and installing the support bracket” on page 40.

Note: The rear adapter-retaining bracket rests against the computer side cover. You might find it easier to lay the computer on its side to replace the side cover.

To replace the side cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have removed all work tools or parts from inside the computer.
2. Install the side cover by placing it into position on the computer. Make sure that the lip on the bottom of the cover rests on the ledge on the bottom of the chassis before rotating the cover up to the vertical position. Press down on the cover-release latch as you slide the side cover forward to lock the side cover.



3. Reconnect the external cables and power cords to the computer; then, connect the power cords to electrical outlets.
4. Turn on the attached devices; then, turn on the computer.

Connecting external options

You can connect a number of optional external devices to the connectors on the rear and front of the computer.

To connect an external device, complete the following steps:

1. Read the safety information beginning on page v, the guidelines in “Handling static-sensitive devices” on page 34, and the documentation that comes with your options.
2. Turn off the computer and all attached devices (see “Turning off the computer” on page 19).
3. Follow the instructions that come with the option to prepare it for installation and to connect it to the computer.

If you are attaching a SCSI device, see “Ultra320 SCSI connector” on page 68 for SCSI ID and cabling information.

Input/output connectors

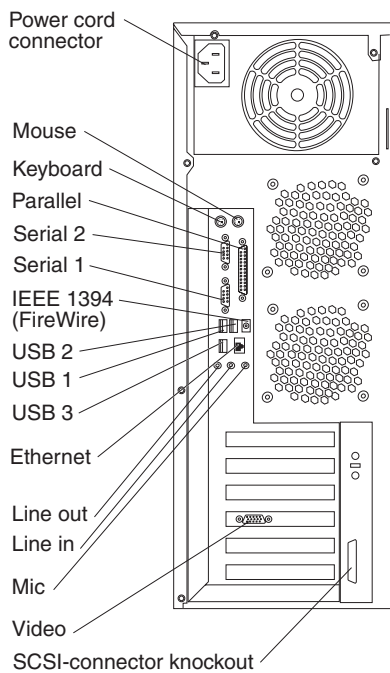
Connect optional external devices to the connectors on the front and rear of the computer.

Your computer has the following input/output (I/O) connectors:

- One audio line in
- Two audio line out
- Two audio microphone

- One Ethernet
- Two IEEE 1394A (FireWire)
- One keyboard
- One mouse
- One parallel
- Two serial
- Five Universal Serial Bus (USB)
- One video

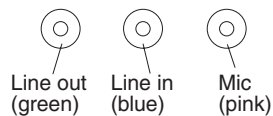
The following illustration shows the locations of the connectors on the rear of the computer. See “Controls, LEDs, and connectors” on page 9 for the locations of the connectors on the front of the computer.



The following sections describe these connectors.

Audio connectors

Use the audio connectors to connect external audio equipment to the computer. The following illustration shows the audio connectors.



Line in

There is one line-in connector on the rear of the computer. The computer receives audio signals through this connector from an external audio device.

Line out

There are two line-out connectors, one on the front and one on the rear of the computer. The computer sends audio signals through this connector to powered speakers with built-in amplifiers, headphones, a multimedia keyboard, or the audio

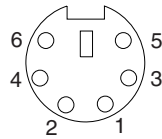
line-in connector on a stereo system. The internal speaker in the computer is disabled when a device is attached to this connector.

Mic

There are two microphone connectors, one on the front and one on the rear of the computer. Connect a microphone to this connector to record sounds onto the hard disk or to use speech-recognition software.

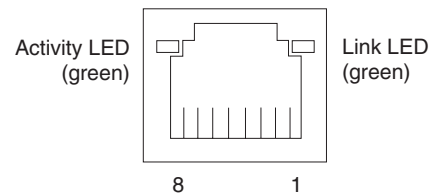
Auxiliary-device (pointing-device) connector

There is one auxiliary-device connector on the rear of the computer. Use this connector to connect a mouse or other pointing device. The following illustration shows an auxiliary-device connector.



Ethernet (RJ-45) connector

There is one Ethernet connector on the rear of the computer. Use this connector to connect the computer to a 10-Mbps, 100-Mbps, or 1000-Mbps network. The following illustration shows an Ethernet connector.



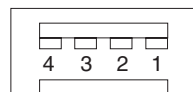
Connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

The Ethernet connector has one LED that indicates Ethernet-link status. When this LED is lit, it indicates that there is an active connection on the Ethernet port. Activity between the computer and the network is indicated by the Ethernet transmit/receive activity LEDs on the front and rear of the computer (see “Controls, LEDs, and connectors” on page 9).

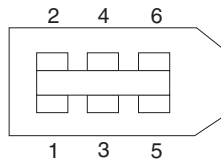
IEEE 1394A (FireWire) connector

There is one 4-pin IEEE 1394A (FireWire) connector on the front of the computer and one 6-pin IEEE 1394A (FireWire) connector on the rear of the computer. Use these connectors to connect IEEE 1394 (FireWire) devices. The following illustrations show the IEEE 1394A (FireWire) connectors.

4-pin IEEE 1394A (FireWire) connector (front)

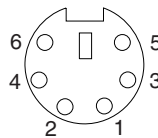


6-pin IEEE 1394A (FireWire) connector (rear)



Keyboard connector

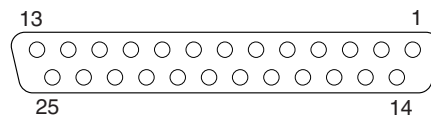
There is one keyboard connector on the rear of the computer. Use this connector to connect a PS/2 (non-USB) keyboard. The following illustration shows a keyboard connector.



If you attach a keyboard to this connector, USB ports and devices are disabled during the power-on self-test (POST).

Parallel connector

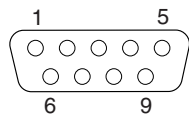
There is one parallel connector on the rear of the computer. Use this connector to connect a parallel device. The following illustration shows a parallel connector.



The parallel connector supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: standard parallel port (SPP), enhanced parallel port (EPP), and extended capability port (ECP). If you configure the parallel port to operate in bidirectional mode, it supports the ECP and EPP modes. When the parallel connector is configured as bidirectional, use an IEEE 1284-compliant cable that does not exceed 3 meters (9.8 ft). Use the **Devices and I/O Ports** options in the IBM Configuration/Setup Utility program to configure the parallel connector as bidirectional.

Serial connectors

There are two serial connectors on the rear of the computer. Use these connectors to connect serial devices. The following illustration shows a serial connector.



Ultra320 SCSI connector

Your computer has an integrated SCSI controller. This dual-channel controller supports two independent, Ultra320 SCSI channels that support up to 15 SCSI devices each. The SCSI connectors for the channels are on the system board. The controller has the following features:

- Double-transition clocking to achieve up to 320 MBps (megabytes per second) data-transfer rates

- Domain name validation to negotiate compatible data-transfer speeds with each device
- Cyclic-redundancy checking (CRC) to improve data reliability
- An active terminator for SCSI bus termination

The following illustration shows a SCSI connector.



SCSI cabling requirements

You can install four internal SCSI devices using the SCSI signal cable that comes with some computer models. If you plan to attach external SCSI devices, you can order an additional SCSI cable, remove the SCSI knockout from the rear of the computer, and connect the new cable from the SCSI channel B connector on the system board to this opening. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative. See “System-board internal connectors” on page 37 for the locations of the SCSI connectors.

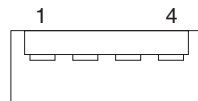
If you want to attach external SCSI devices to the computer without using the internal SCSI channel B, you must install an optional SCSI adapter.

Setting SCSI IDs

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. See the information that comes with the device for instructions for setting its SCSI ID.

Universal Serial Bus connectors

There are five Universal Serial Bus (USB) 2.0 connectors, two on the front and three on the rear of the computer. Use the USB connectors to connect optional telephony and multimedia devices. USB 2.0 technology transfers data at up to 480 Mb per second (Mbps) with a maximum of 127 external devices and a maximum signal distance of 5 meters (16 ft) per segment (if the device that is attached to the computer is a USB 2.0 device). If multiple USB devices are attached to the computer, the USB hub must be USB 2.0; otherwise, all USB 2.0 devices will transfer data at 12 Mbps. Using Plug and Play technology, USB devices are configured automatically. The following illustration shows a USB connector.



Use a 4-pin USB cable to connect an external devices to a USB connector.

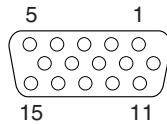
If you connect a PS/2 (non-USB) keyboard to the keyboard connector, USB ports and devices are disabled during power-on self-test (POST).

If you connect a USB keyboard that has a mouse port, the keyboard emulates a mouse, and you cannot disable the mouse settings in the Configuration/Setup Utility program.

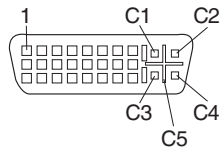
Video connector

The video adapter, which is in the PCI Express x16 slot on the system board, provides the video connector. This connector is on the rear of the computer. Use the video connector to connect a monitor or other display device. The following illustrations show examples of different video connectors.

Analog video connector



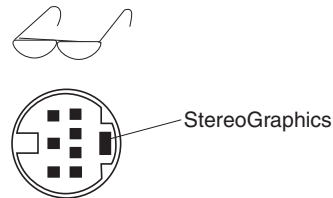
Digital (DVI-I) video connector



Dual Monitor System-59 (DMS-59) video connector



Stereo shutter glasses video connector



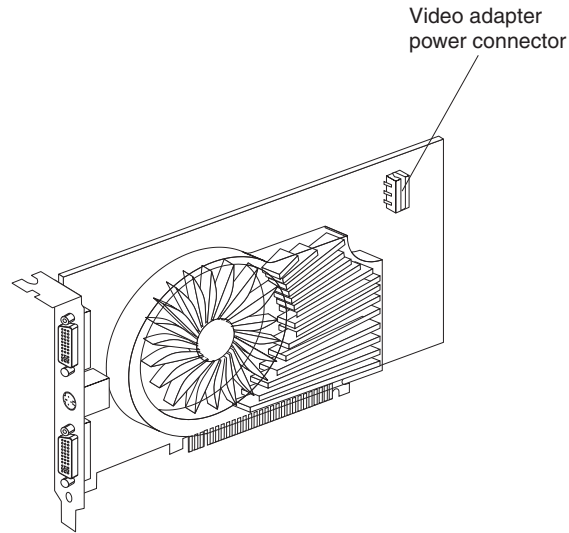
Some models come with a digital video interface (DVI) connector for connecting a digital monitor. If you have problems viewing information with a second monitor, see “Changing monitor settings” on page 15.

Models with the NVIDIA Quadro FX 1400, NVIDIA Quadro FX 3400 video, or 3DLabs Wildcat Realizm 800 adapter come with a DVI-I to VGA style analog converter for each DVI-I connector.

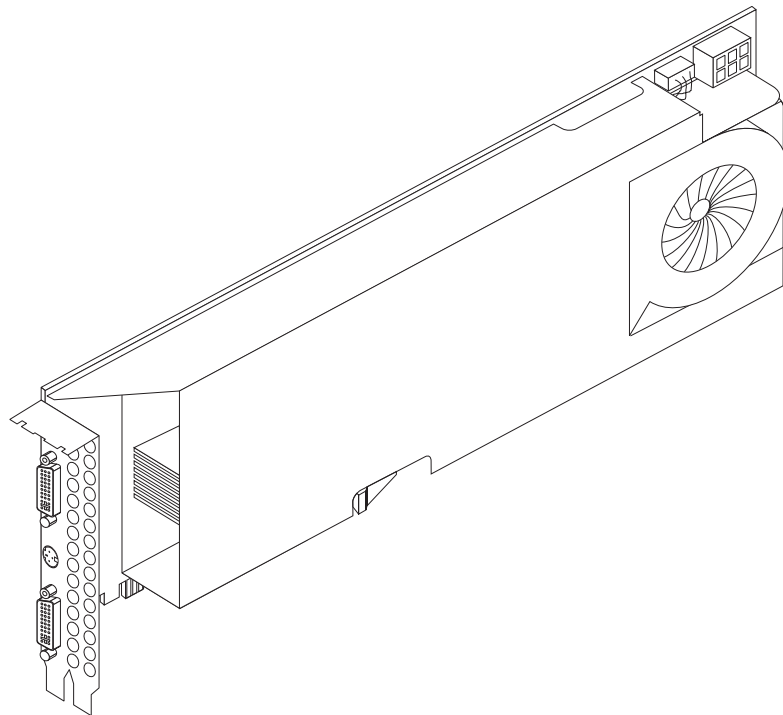
If your software application supports it, the connector identified by an eyeglasses icon is used for stereo shutter glasses.

Attention: To get the best performance from the NVIDIA Quadro FX 3400 and 3Dlabs Wildcat Realizm video adapters, you must connect the video adapter to the computer power supply. Otherwise, the video adapter will be operating with very limited power, resulting in a decrease in performance for some applications. Use the PCI Express x16 power drop to connect the video adapter to the computer power supply. The following illustration shows the location of the video adapter power connector:

Note: The illustrations in this document might differ slightly from your hardware.



The following illustration shows the 3Dlabs Wildcat Realizm 800 video adapter. When this video adapter is installed, it overlaps the PCI slot below it. Therefore, you will have one less PCI slot available in which you can install a video adapter.



Models with the NVIDIA Quadro NVS 280 video adapter come with a Dual Monitor System-59 (DMS-59) to dual-analog monitor pigtail cable. If you want to set up two

digital monitors, you will have to purchase a separate dual-digital monitor cable.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Intellistation Documentation* CD or at the IBM Support Web site.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, go to <http://www.ibm.com/services/>, or go to <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Appendix B. Notices

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Chipkill	ThinkPad
EtherJet	Tivoli
e-business logo	Tivoli Enterprise
@server	Update Connector
FlashCopy	Wake on LAN
IBM	XA-32
IBM (logo)	XA-64
IntelliStation	X-Architecture
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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Product recycling and disposal

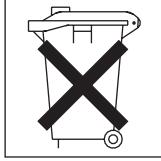
This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



Electronic emission notices

IBM IntelliStation A Pro Type 6217

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

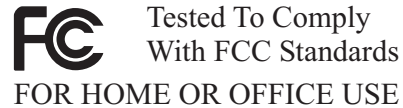
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible party:
International Business Machines Corporation
New Orchard Road
Armonk, NY 10504

Telephone: 1-919-543-2193



Industry Canada Class B emission compliance statement

This Class B digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards. This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

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